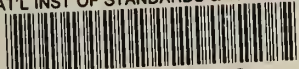


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Bond Dissociation Energies In Simple Molecules

U.S. DEPARTMENT OF COMMERCE

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UNITED STATES DEPARTMENT OF COMMERCE

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NATIONAL BUREAU OF STANDARDS • Lewis M. Branscomb, *Director*

Bond Dissociation Energies in Simple Molecules

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Foreword

The National Standard Reference Data System provides effective access to the quantitative data of physical science, critically evaluated and compiled for convenience, and readily accessible through a variety of distribution channels. The System was established in 1963 by action of the President's Office of Science and Technology and the Federal Council for Science and Technology, with responsibility to administer it assigned to the National Bureau of Standards.

The System now comprises a complex of data centers and other activities, carried on in academic institutions and other laboratories both in and out of government. The independent operational status of existing critical data projects is maintained and encouraged. Data centers that are components of the NSRDS produce compilations of critically evaluated data, critical reviews of the state of quantitative knowledge in specialized areas, and computations of useful functions derived from standard reference data. In addition, the centers and projects establish criteria for evaluation and compilation of data and make recommendations on needed improvements in experimental techniques. They are normally closely associated with active research in the relevant field.

The technical scope of the NSRDS is indicated by the principal categories of data compilation projects now active or being planned: nuclear properties, atomic and molecular properties, solid state properties, thermodynamic and transport properties, chemical kinetics, and colloid and surface properties.

The NSRDS receives advice and planning assistance from the National Research Council of the National Academy of Sciences-National Academy of Engineering. An overall Review Committee considers the program as a whole and makes recommendations on policy, long-term planning, and international collaboration. Advisory Panels, each concerned with a single technical area, meet regularly to examine major portions of the program, assign relative priorities, and identify specific key problems in need of further attention. For selected specific topics, the Advisory Panels sponsor subpanels which make detailed studies of users' needs, the present state of knowledge, and existing data resources as a basis for recommending one or more data compilation activities. This assembly of advisory services contributes greatly to the guidance of NSRDS activities.

The NSRDS-NBS series of publications is intended primarily to include evaluated reference data and critical reviews of long-term interest to the scientific and technical community.

LEWIS M. BRANSCOMB, *Director*

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Bond Dissociation Energies in Simple Molecules

B. deB. Darwent

Bond dissociation energy values (kcal/mol) and (kJ/mol) of simple compounds are tabulated from a literature review covering the years 1962–1966 inclusively. Some selected values which appeared in the years 1956–1962 are also included. Organic compounds are excluded except those containing one carbon atom. The groups $> \text{CO}$ and $-\text{CN}$ are not considered to be organic.

The values are quoted usually at 0 K or 298 K and refer to the gaseous state. They represent the energy required to break a bond at the specified temperature with all substances in the zero vibrational state of the ground electronic state. The experimental method for the energy value listed is given and referenced in the table. A value recommended by the author is listed as the final value for each reaction.

Key words: Bond dissociation energy; gaseous state; inorganic simple compounds; recommended value; zero vibrational state of the ground electronic state.

Introduction

This review of bond dissociation energies of simple compounds includes values published, generally, between 1956 and 1966 inclusive. The period from 1956 to 1962 was covered less thoroughly than that of 1962 to 1966. Cottrell's book [3]¹ appeared in 1958 and is assumed to have covered the literature up to and including 1955; the compilation of Vedeneyev et al. [6] covered the field to 1962, but they did not attempt a complete coverage of the literature. In the present review all values appearing between 1962 and 1966, and selected values appearing between 1956 and 1962 have been given in the table, even if some of them may now be considered to be inaccurate or completely untrustworthy. This approach is of some value, especially for bonds on which only a few measurements have been made, since opinions of relative merit often change with time. The efficiency of retrieval of information, within the stated period, is estimated to be approximately 80 percent.

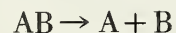
Organic compounds have been excluded, in view of Kerr's excellent review [8] of 1966, although compounds containing one carbon atom have been included; the groups $> \text{CO}$ and $-\text{CN}$ are not regarded as being organic.

Very recent data on thermochemical properties have been published by the National Bureau of Standards as Technical Note 270–3 [9]; many bond dissociation energies have been recalculated from those data. It should be pointed out that the data in Ref. [9] often include input from spectroscopic and other types of measurements. Thus a dissociation energy labeled "Thermochemical; based on [9]" in this tabulation is not necessarily derived solely from conventional thermochemical measurements.

The bonds are listed alphabetically under the more electropositive elements except for bonds

between H and other elements, which are given under the other element. Thus data on O–H, H–Cl, etc., are found under O, Cl, etc.

The bond dissociation energy D° for a bond A–B which is broken through the reaction



is defined here as the standard-state enthalpy change for the reaction at a specified temperature. That is,

$$D^\circ = \Delta H_f^\circ(\text{A}) + \Delta H_f^\circ(\text{B}) - \Delta H_f^\circ(\text{AB})$$

where ΔH_f° is the standard-state heat of formation. All values of D° refer to the gaseous state, and are given at either 0 K or 298 K, and in some cases at both temperatures. The few exceptions are noted under "Remarks". The value of D° at 0 K is equal to the energy required to break the A–B bond under the stipulated conditions that the reactant and product molecules are in their electronic and vibrational ground states. Thus it has a clearer physical interpretation than the dissociation energy at other temperatures. In the simplest case where the bond of a diatomic molecule is broken, D° at 298 K is greater than D° at 0 K by an amount which lies between RT and $(3/2) RT$ (i.e., 0.6 to 0.9 kcal/mol). In polyatomic molecules this difference may be somewhat greater.

The values of D° are listed in both kcal/mol and kJ/mol. The conversion factor is 1 kcal/mol = 4.184 kJ/mol.

No attempt will be made here to describe or discuss the many methods used to measure bond dissociation energies since that has already been done [1 to 8]. It is well known that individual methods are useful and reliable only for limited types of molecules and over limited ranges of conditions. Thus the classic static manometric

¹ Figures in brackets indicate the literature references on page 2.

method gives excellent results for I_2 , N_2O_4 , etc. but not for dibenzyl; the spectroscopic method gives values of the highest precision for simple molecules, especially when the dissociation products are unequivocal and a clear convergence can be obtained, but it is much less useful for more complex molecules.

Many determinations of bond dissociation energies have recently appeared using high temperatures chemistry techniques, e.g., effusion from a Knudsen cell and the use of mass spectrometry to identify and measure the concentrations of the effusing materials. Most of the measurements on the oxides of the Group IIA elements have been made by that technique and by flame photometry. In theory both methods are capable of giving values of at least modest precision for the bond dissociation energies. Although in some cases the data so obtained are often consistent and fairly precise, in other instances, e.g. CaO, there is considerable disagreement, not only between the two methods but also between values obtained by the same method.

There has been much controversy on the relative merits of these two techniques. The high temperature mass-spectrometry results are suspect [55] because of the possibility of fragmentation of the molecule under electron impact. In another review [190] it is claimed that Drowart and Goldfinger [10] had already refuted that suggestion. Actually, Drowart and Goldfinger did not really disprove the claim but rather stated that interaction with the alumina container is likely to be a more important source of uncertainty. On the other hand, there does appear to be doubt concerning both the nature of the emitter and the possibility of interference by other substances in the flame photometric work.

At this stage the only safe conclusion is that much more research is required.

The estimated uncertainties of individual measurements are those given by the original authors or reviewers. Recommended values are listed in bold type with estimated uncertainties. Those estimates are based on the extent of agreement between different measurements, more weight being given to the results from the more reliable method, when the datum results from a direct measurement. For thermochemically calculated values consideration is given to the precision of each of the thermochemical quantities involved in the calculation. No attempt has been made at a statistical evaluation of uncertainties. They are to some extent the result of my own prejudice, though often tempered by the advice of experts.

The author is grateful to the Catholic University of America for leave of absence and sabbatical leave and to the National Bureau of Standards for space and technical and financial assistance. The space was provided by the Physical Chemistry Division and the financial assistance by the Office of Standard Reference Data, National Bureau of Standards. It is indeed a pleasure to acknowledge the help and advice given by Dr. D. Garvin of the Elementary Processes Section and Dr. S. A. Rossmassler of the Office of Standard Reference Data. The author is greatly indebted to Dr. W. H. Evans for many discussions and advice about thermochemical measurements and to Dr. H. M. Rosenstock for information on many matters, mostly scientific.

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Table of Bond Dissociation Energies

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Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Ag-Ag	$\text{Ag}_2 \rightarrow 2\text{Ag}$	171.5	41.0			Effusion; M.S.	1957	95
		157.3	37.6			Effusion; M.S.	1956	198
		157.3	37.6			Effusion; M.S.	1960	91
		163	39			Analysis of data	1956	3
		157.3 ± 9.2	37.6 ± 2.2			Analysis of data	1962	6
		171 ± 8	41 ± 2			Analysis of data	1963	7
		156.9	37.5			Thermochemical;	1967	
		159 ± 8	38 ± 2			based on 9		
Ag-Au	$\text{AgAu} \rightarrow \text{Ag} + \text{Au}$	199.2 ± 9.2	47.6 ± 2.2			Effusion; M.S.	1960	91
Ag-Br	$\text{AgBr} \rightarrow \text{Ag} + \text{Br}$	289	69			Thermochemical	1956	3
		251.0	60			Thermochemical	1950	4
		289 ± 42	69 ± 10			Thermochemical	1962	6
		289 ± 42	69 ± 10					
Ag-Cl	$\text{AgCl} \rightarrow \text{Ag} + \text{Cl}$	301	72			Thermochemical	1956	3
		299.2	71.5			Thermochemical	1950	4
		318 ± 21	76 ± 5			Thermochemical	1962	6
		314 ± 21	75 ± 5					
Ag-Cu	$\text{AgCu} \rightarrow \text{Ag} + \text{Cu}$	170.3	40.7	174.1	41.6	Effusion; M.S.	1960	91
		170.3 ± 9.2	40.7 ± 2.2			Effusion; M.S.	1967	
		170.3	40.7			Thermochemical;		
		172 ± 8	41 ± 2			based on 9		
Ag-H	$\text{AgH} \rightarrow \text{Ag} + \text{H}$	243	58			Analysis of data	1956	3
		241.0	57.6			Thermochemical	1950	4
		222 ± 8	53 ± 2			Extrapolation of $X^1\Sigma$	1962	6
		230 ± 13	55 ± 3			levels		
Ag-I	$\text{AgI} \rightarrow \text{Ag} + \text{I}$	287.4	68.7			Convergence in B state	1950	4
Ag-O	$\text{AgO} \rightarrow \text{Ag} + \text{O}$	238 ± 42	57 ± 10			L.B.S. for ground state	1962	6
		134 ± 38	32 ± 9			L.B.S. for $B^2\Sigma$ state	1953	1
Ag-Sn	$\text{AgSn} \rightarrow \text{Ag} + \text{Sn}$	132.2 ± 21	31.6 ± 5			Effusion; M.S.	1960	63
Al-Al	$\text{Al}_2 \rightarrow 2\text{Al}$	188 ± 42	45 ± 10	167	40	M.S.	1962	6
		163	39			Thermochemical;	1967	
						based on 9		

*Throughout the table in the Methods, remarks column, the following abbreviations have been used: M.S.—Mass Spectrometer; L.B.S.—Linear Birge-Spencer Extrapolation; E.I.—Electron Impact; A.P.—Appearance Potential.

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Al-Br	AlBr \rightarrow Al + Br	439	105			Analysis of data Thermochemical; based on 9	1960	140
		439	105 105 ± 2	443	106		1967	
Al-Cl	AlCl \rightarrow Al + Cl	490	117			Analysis of data Thermochemical; based on 9	1960	140
		492.0 490 ± 13	117.6 117 ± 3	495.8 494 ± 13	118.5 118 ± 3		1967	
	AlCl ₂ \rightarrow AlCl + Cl	391.2 \pm 21	93.5 \pm 5	393.3 406	94.0 97	Thermochemical	1962	6
		400 ± 8	95.5 ± 2	402 ± 8	96 ± 2			
	AlCl ₃ \rightarrow AlCl ₂ + Cl	397 \pm 21	95 \pm 5	400 372	95.5 89	Thermochemical Thermochemical; based on 9	1962	6
		372 ± 8	89 ± 2	372 ± 8	89 ± 2		1967	
	OAlCl \rightarrow AlO + Cl			552	132	Thermochemical; based on 9 Thermochemical	1967	
				515 \pm 84	123 \pm 20		1962	6
Al-F	AlF \rightarrow Al + F	653	156			Analysis of data Equilibrium pressure; AlF ₃ (C) + 2Al = 3AlF(S) Thermochemical Thermochemical Effusion; M.S. Effusion; M.S. AlF ₃ + 2Al = 3AlF Thermochemical; based on 9	1960	140
		653.1 \pm 7.5	156.1 \pm 1.8				1959	178
		661	158			Thermochemical Thermochemical Effusion; M.S. Effusion; M.S. AlF ₃ + 2Al = 3AlF Thermochemical; based on 9	1956	133
		649	155				1957	95
		665 \pm 13	159 \pm 3			Thermochemical Effusion; M.S. Effusion; M.S. AlF ₃ + 2Al = 3AlF Thermochemical; based on 9	1966	170
		661 \pm 8	158 \pm 2				1963	174
		654.8 \pm 8	156.5 \pm 2			Thermochemical; based on 9	1962	6
		659.0 659.0 ± 6.2	157.5 157.5 ± 1.5	663.3 663.6 ± 6.2	158.6 158.6 ± 1.5		1967	
	AlF ₂ \rightarrow AlF + F	546.0 \pm 42	130.5 \pm 10			Thermochemical	1962	6
	AlF ₃ \rightarrow AlF ₂ + F	544 \pm 46	130 \pm 11			Thermochemical	1962	6
	OAlF \rightarrow AlO + F			674 \pm 84 761 761 ± 42	161 \pm 20 182 182 ± 10	Thermochemical Thermochemical; based on 9	1962 1967	6
Al-H	AlH \rightarrow Al + H	< 295	< 70.5			Predissociation Spectroscopic; predis- sociation Thermochemical Thermochemical; based on 9	1950	4
		280.7 \pm 5.0	67.1 \pm 1.2				1961	53
		280 \pm 21	67 \pm 5			Thermochemical	1962	6
		280	67	284.9	68.1	Thermochemical; based on 9	1967	
		280.3 ± 6.3	67.0 ± 1.5	284.9 ± 6.3	68.1 ± 1.5			

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.	
		0 K		298 K					
		kJ/mol	kcal/mol	kJ/mol	kcal/mol				
Al-I	$\text{AlI} \rightarrow \text{Al} + \text{I}$	364.0	87.0			Analysis of fluctuation bands	1960	140	
		364 ± 13	87 ± 3			Analysis of data	1962	6	
		364	87	367.7	87.9	Thermochemical;	1967		
		364 ± 4	87 ± 1	368 ± 4	88 ± 1	based on 9			
Al-O	$\text{AlO} \rightarrow \text{Al} + \text{O}$	481 ± 21	115 ± 5			Effusion; M.S.	1960	104	
		569	136			Flame photometry	1958	16	
		481 ± 21	115 ± 5			Thermochemical	1962	6	
		479.5	114.6	484.5	115.8	Thermochemical;	1967		
		481 ± 8	115 ± 2	485 ± 8	116 ± 2	based on 9			
		$\text{OAlF} \rightarrow \text{AlF} + \text{O}$			582	139	Thermochemical;	1967	
		$\text{OAlCl} \rightarrow \text{AlCl} + \text{O}$			540	129	Thermochemical;	1967	
					540 ± 41	129 ± 10	based on 9		
	Al-P	$\text{AlP} \rightarrow \text{Al} + \text{P}$	212.6 ± 13	50.8 ± 3			Effusion; M.S.	1966	169
	Al-S	$\text{AlS} \rightarrow \text{Al} + \text{S}$	339 ± 67	81 ± 16			Spectroscopic; L.B.S.	1959	54
326 ± 21			78 ± 5			Spectroscopic; predissociation	1962	6	
402			96	406	97	Thermochemical;	1967		
						based on 9			
As-As	$\text{As}_2 \rightarrow 2\text{As}$	379.9 ± 21	90.8 ± 5			Spectroscopic; predissociation	1962	6	
		379.9	90.8	382.8	91.5	Thermochemical;	1967		
		380 ± 21	91 ± 5	382.8 ± 21	91.5 ± 5	based on 9			
As-Cl	$\text{AsCl}_3 \rightarrow \text{AsCl}_2 + \text{Cl}$	444	106	448	107	Thermochemical;	1967		
						based on 9			
As-N	$\text{AsN} \rightarrow \text{As} + \text{N}$	628 ± 126	150 ± 30			L.B.S.	1962	6	
		577	138	582	139	Thermochemical;	1967		
						based on 9			
As-O	$\text{AsO} \rightarrow \text{As} + \text{O}$	473 ± 8	113 ± 2	477	114	Spectroscopic; predissociation	1960	6	
		477.4	114.1	481.6	115.1	Thermochemical;	1967		
		477 ± 8	114 ± 2	481	115 ± 2	based on 9			
At-At	$\text{At}_2 \rightarrow 2\text{At}$	115.9	27.7			Theoretical	1960	109	

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Au-Au	$\text{Au}_2 \rightarrow 2\text{Au}$	210.5	50.3			Thermochemical; M.S.	1956	108
		221.8	53.0			Effusion; M.S.	1957	95
		215.5	51.5			Effusion; M.S.	1960	91
		215.1	51.4	217	51.9	Thermochemical;	1967	
		215.5 ± 6.3	51.5 ± 1.5	218 ± 6	52 ± 1.5	based on 9		
Au-Cl	$\text{AuCl} \rightarrow \text{Au} + \text{Cl}$	293 ± 59	70 ± 14			Spectroscopic; L.B.S.	1962	6
		289	69	293	70	Thermochemical;	1967	
		289 ± 63	69 ± 15	293 ± 63	70 ± 15	based on 9		
Au-Cr	$\text{AuCr} \rightarrow \text{Au} + \text{Cr}$	210.9 ± 14.6	50.4 ± 3.5			M.S.	1962	62
		213	51			Thermochemical;	1967	
		211.3 ± 6.3	50.5 ± 1.5			based on 9		
Au-Cu	$\text{AuCu} \rightarrow \text{Au} + \text{Cu}$	228.0 ± 9.2	54.5 ± 2.2			Effusion; M.S.	1960	91
Au-H	$\text{AuH} \rightarrow \text{Au} + \text{H}$	297 ± 10	71 ± 2.5			Spectroscopic	1962	6
		285.3	68.2	289.1	69.1	Thermochemical;	1967	
		285 ± 13	68 ± 3	289 ± 13	69 ± 3	based on 9		
Au-Pd	$\text{AuPd} \rightarrow \text{Au} + \text{Pd}$	139.3 ± 21	33.3 ± 5			M.S.	1962	62
Au-Sn	$\text{AuSn} \rightarrow \text{Au} + \text{Sn}$	240.6 ± 17	57.5 ± 4			Effusion; M.S.	1962	63
B-B	$\text{B}_2 \rightarrow 2\text{B}$	274.1	65.5			M.S.	1962	58
		260.7	62.3			M.S.	1962	6
		293	70	297	71	Thermochemical;	1967	
		293 ± 21	70 ± 5	297 ± 21	71 ± 5	based on 9		
	$\text{B}_2\text{Cl}_4 \rightarrow 2\text{BCl}_2$	331	79			Calorimetry	1959	102
		246.0	58.8			Thermochemical	1962	6
	$\text{B}_2\text{F}_4 \rightarrow 2\text{BF}_2$			151	36	Thermochemical	1962	6
	$\text{B}_2\text{O}_2 \rightarrow 2\text{BO}$	> 416.7	> 99.6			Effusion; M.S.	1956	90
		498 ± 84	119 ± 20	502	120	Thermochemical	1962	6
		502	120	506	121	Thermochemical;	1967	
		502 ± 84	120 ± 20	506 ± 84	121 ± 20	based on 9		
B-Br	$\text{BBr} \rightarrow \text{B} + \text{Br}$	431	103			Analysis of data	1960	140
		433.0 ± 8	103.5 ± 2	436.8	104.4	Analysis of data	1962	6
		433.0	103.5	436.4	104.3	Thermochemical;	1967	
		433.0 ± 21	103.5 ± 5	435 ± 21	104 ± 5	based on 9		

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
B-C	$BC \rightarrow B + C$	444	106			Thermochemical; based on 9	1967	
B-Cl	$BCl \rightarrow B + Cl$	531	127			Analysis of data	1960	140
		494 \pm 42	118 \pm 10	498	119	Spectroscopic; extrapolation	1962	6
		531	127	536	128	Thermochemical; based on 9	1967	
	$OBCl \rightarrow BO + Cl$			515 \pm 75 460 460 \pm 42	123 \pm 18 110 110 \pm 10	Thermochemical Thermochemical; based on 9	1962 1967	6
B-F	$BF \rightarrow B + F$	774	185			Analysis of data	1960	140
		774 \pm 63	185 \pm 15	778	186	Spectroscopic	1962	6
		753 \pm 13	180 \pm 3			Effusion; M.S.	1966	170
		757 \pm 17	181 \pm 4			M.S.; B(c) + CaF ₂ (c) = BF(g) + CaF(g)	1965	69
		759.8 759.4 \pm 10.5	181.6 181.5 \pm 2.5	764.0 766 \pm 13	182.6 183 \pm 3	Thermochemical; based on 9	1967	
	$BF_2 \rightarrow BF + F$	565 \pm 105 515 523 \pm 63	135 \pm 25 123 125 \pm 15	569	136	Thermochemical M.S.; B(c) + CaF ₂ (c) = BF(g) + CaF(g)	1962 1965	6 69
		$BF_3 \rightarrow BF_2 + F$	557 \pm 84 665	133 \pm 20 159	561	134	Thermochemical M.S.; B(c) + CaF ₂ (c) = BF(g) + CaF(g)	1962 1965
	$FBO \rightarrow Bo + F$		820 \pm 113	196 \pm 27	824 711 711 \pm 42	197 170 170 \pm 10	Thermochemical Thermochemical; based on 9	1962 1967
B-H	$BH \rightarrow B + H$	289 \pm 38 327.2 327.2 326 \pm 4	69 \pm 9 78.2 \pm 1 78.2 78 \pm 1			Spectroscopic	1953	1
						Predissociation	1962	6
				331.0	79.1	Thermochemical; based on 9	1967	
B-N	$BN \rightarrow B + N$	385 \pm 50	92 \pm 12			L.B.S. for ground and ³ Π states	1962	6
		385 385 \pm 21	92 92 \pm 5	389 389 \pm 21	93 93 \pm 5	Thermochemical; based on 9	1967	

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.	
		0 K		298 K					
		kJ/mol	kcal/mol	kJ/mol	kcal/mol				
B-O	BO \rightarrow B + O	715	171			L.B.S. for $X^2\Sigma$, $A^2\Pi$, $B^2\Sigma$, $C^2\Pi$.	1960	50	
		770 \pm 46	184 \pm 11	774	185		1959	51	
		782	187	787	188	Thermochemical;	1967		
			782 \pm 42	187 \pm 10	787 \pm 42	188 \pm 10	based on 9		
	ClBO \rightarrow BCl + O			791 \pm 75	189 \pm 18	Thermochemical	1962	6	
				711	170	Thermochemical;	1967		
				171 \pm 10	based on 9				
	FBO \rightarrow BF + O	816 \pm 117	195 \pm 28	820	196	Thermochemical	1962	6	
				732	175	Thermochemical;	1967		
				732 \pm 42	175 \pm 10	based on 9			
B-S	BS \rightarrow B + S	577 \pm 117	138 \pm 28	582	139	Spectroscopic	1962	6	
		494	118	498	119	Thermochemical;	1967		
		494 \pm 42	118 \pm 10	498 \pm 42	119 \pm 10	based on 9			
B-Si	BSi \rightarrow B + Si	285	68			Thermochemical;	1967		
						based on 9			
Ba-Br	BaBr \rightarrow Ba + Br	269.9 \pm 54	64.5 \pm 13	274.1	65.5	Spectroscopic; L.B.S. for	1962	4; 6	
						ground state			
		This value is probably too low (see 11)							
	BaBr ₂ \rightarrow BaBr + Br			598 \pm 54	143 \pm 13	Thermochemical	1962	6	
		If D_1 is too low (see above); this value is too high							
Ba-Cl	BaCl \rightarrow Ba + Cl	259 \pm 50	62 \pm 12	264	63	Spectroscopic; L.B.S. for	1962	4; 6	
						ground state			
		494 \pm 21	118 \pm 5			Flame photometry;	1964	11	
						H ₂ + O ₂ + N ₂			
					Flame photometry;	1965	23		
					H ₂ + O ₂ + N ₂				
		477 \pm 25	114 \pm 6						
	494	118 \pm 10							
BaCl ₂ \rightarrow BaCl + Cl				728 \pm 50	174 \pm 12	Thermochemical	1962	6	
		201 gives $D_1 + D_2 = 236$ Kcal mol ⁻¹ ; D_2 is probably about 236 - 118 \pm 10 = 118 \pm 10 Kcal mol ⁻¹ .							
		431 \pm 42	103 \pm 10			Flame photometry;	1965	23	
		456 \pm 42	109 \pm 10			H ₂ + O ₂ + N ₂			

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Ba-F	BaF \rightarrow Ba + F	364 ± 71	87 ± 17	368	88	Spectroscopic; L.B.S. for ground state.	1962	4; 6
		561 ± 8	134 ± 2			Effusion; M.S.;	1964	68
		552 ± 17	132 ± 4			2BaF = Ba + BaF ₂ Effusion; M.S.;	1964	68
		602 ± 29	144 ± 7			Ba + AlF = Al + BaF		
		569 ± 42	136 ± 10			Flame photometry; H ₂ + O ₂ + N ₂	1964; 1965	11; 23
	BaF ₂ \rightarrow BaF + F			799 ± 71	191 ± 17	Thermochemical Effusion; M.S.	1962 1964	6 68
		584.1 ± 25	139.6 ± 6					
		201 gives $D_1 + D_2 = 279$ Kcal mol ⁻¹ ; 68 gives 273, and 6 gives 279 Kcal mol ⁻¹ .						
		569 ± 42	136 ± 10			Flame photometry; H ₂ + O ₂ + N ₂	1964	11
		586 ± 42	140 ± 10					
Ba-H	BaH \rightarrow Ba + H	172 ± 8	41 ± 2	176	42	Spectroscopic; pre- dissociation of C ² Σ	1962	1; 6
		195.5	46.73			Spectroscopic; predissociation	1966 1965	25; 24; 26
		197.3	47.16			Spectroscopic; Rydberg extrapolation	1966 1965	25; 24; 26
Ba-O	BaO \rightarrow Ba + O	482.4 ± 9.6	115.3 ± 2.3			Flame photometry; CO-Air; Band & Line Intensity	1965	71
		539 ± 14.6	128.7 ± 3.5			Thermochemical	1951	12
		544 ± 21	130 ± 5			Effusion; M.S.	1955	13
		573 ± 8	137 ± 2	577	138	M.S.	1962	6
		590 ± 42	141 ± 10			Thermochemical	1964	144
		545.6 ± 25	130.4 ± 6			M.S.; Ba + SO = BaO + S	1964	189
		577 ± 21	138 ± 5			Flame photometry H ₂ + O ₂	1966	191
		567.4 ± 21	135.6 ± 5			Thermochemical	1964	14
		561 ± 21	134 ± 5			Recalculated from earlier data	1965	22
		561 ± 42	134 ± 10					
	BaOH \rightarrow Ba + OH	448	107			Effusion; M.S.; 2BaO + HOH = BaOH + O.	1964	14
		464 ± 33	111 ± 8			Flame photometry; H ₂ + O ₂ + N ₂	1965	22
		477	114			Flame photometry; H ₂ + O ₂ + N ₂	1965	48
		473 ± 42	113 ± 10					
	Ba(OH) ₂ \rightarrow BaOH + OH	414	99			Effusion; M.S.	1964	14
		Ref. 191 gives $D_1 + D_2 = 229 \pm 12$ Kcal mol ⁻¹ ; 14 gives $D_1 + D_2 = 206$ Kcal mol ⁻¹ .						
		510 ± 50	122 ± 12			Based on $D_2 = 107$; $D_1 + D_2 = 229 \pm 12$		191 14
		460 ± 84	110 ± 20					

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Ba-S	BaS \rightarrow Ba + S	396.2 ± 18.8	94.7 ± 4.5			Effusion; M.S.	1964	189
Be-Cl	BeCl \rightarrow Be + Cl	460 ± 63	110 ± 15	464	111	Spectroscopic; ex- trapolation of $X^2\Sigma$ and $A^2\Pi$.	1962	6
		385 385 ± 63	92 92 ± 15	389 389 ± 63	93 93 ± 15	Thermochemical; based on 9	1967	
	BeCl ₂ \rightarrow BeCl + Cl	456 ± 63	109 ± 15	460 539.7	110 129.0	Thermochemical Thermochemical; based on 9	1962 1967	6
		536 ± 63	128 ± 15	540 ± 63	129 ± 15			
Be-F	BeF \rightarrow Be + F	669 ± 84	160 ± 20	674	161	Spectroscopic; extrapolation of $X^2\Sigma$ and $A^2\Pi$.	1962	6
		< 656.1 < 617.6	< 156.8 < 147.6			M.S.; Be + BeF ₂ = 2BeF	1965	73
						M.S.; Al + BeF ₂ = BeF + AlF	1965	73
		564.4 ± 9.6 575.3 573 ± 42	134.9 ± 2.3 137.5 137 ± 10	579.1 577 ± 42	138.4 138 ± 10	M.S. Thermochemical; based on 9	1966 1967	166
	BeF ₂ \rightarrow BeF + F	586 ± 84	140 ± 20	590 698.7	141 167.0	Thermochemical Thermochemical; based on 9	1962 1967	6
		690 ± 63	165 ± 15	699 ± 63	167 ± 15			
Be-H	BeH \rightarrow Be + H	222 ± 29	53 ± 7	226	54	Spectroscopic; extrapola- tion of $X^2\Sigma$ and $A^2\Pi$	1962	6
		222	53	226	54	Thermochemical; based on 9	1967	
		222 ± 21	53 ± 5	226 ± 21	54 ± 5			
Be-O	BeO \rightarrow Be + O	445.2 ± 12.6	106.4 ± 3	449.4	107.4	M.S.	1962	6
		443.9 ± 9.6	106.1 ± 2.3			Spectroscopic	1964	86
				448	107	Thermochemical; based on 9	1967	
		444 ± 21	106 ± 5	448 ± 21	107 ± 5			
Bi-Bi	Bi ₂ \rightarrow 2Bi	197 ± 4	47 ± 1	201	48	Thermochemical; ΔH_{vap}	1962	6
		192.5	46.0	194.6	46.5	Thermochemical; based on 9	1967	
		192 ± 4	46 ± 1	197 ± 4	47 ± 1			
Bi-S	BiS \rightarrow Bi + S			305	73	Thermochemical; based on 9	1967	

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Bi-Se	BiSe \rightarrow Bi + Se	231.4	55.3	259	61.8	Effusion; M.S. Thermochemical; based on 9	1960 1967	61
Bi-Te	BiTe \rightarrow Bi + Te	202.5	48.4	225	53.7	Effusion; M.S. Thermochemical; based on 9	1960 1967	61
Br-Br	Br ₂ \rightarrow 2Br	190.08 \pm .12	45.43 \pm 0.03	192.9	46.1	Spectroscopic; con- vergence of bands	1962	6
		190.18	45.455	192.86	46.095	Thermochemical;	1967	
		190.16 \pm .04	45.45 \pm 0.01	192.88 \pm 0.04	46.10 \pm 0.01	based on 9		
Br-Cl	BrCl \rightarrow Br + Cl	215.30 \pm 0.25	51.458 \pm 0.06	218.4	52.2	Thermochemical	1962	6
		215.85	51.59	218.91	52.32	Thermochemical;	1967	
		215.9 \pm 0.4	51.6 \pm 0.1	218.8 \pm 0.4	52.3 \pm 0.1	based on 9		
Br-F	BrF \rightarrow Br + F	230.04 \pm 0.25	54.98 \pm 0.06	233.5	55.8	Spectroscopic; converg- ence of bands	1962	6
		281.2	67.2	284.9	68.1	Thermochemical; based on 9	1967	
Br-H	HBr \rightarrow H + Br	362.71 \pm 0.54	86.69 \pm 0.13	366.5	87.6	Thermochemical	1962	6
		361.5	86.4			Theoretical	1963	178
		362.50	86.64	366.27	87.54	Thermochemical;	1967	
		362.3 \pm 0.4	86.6 \pm 0.1	366.1 \pm 0.4	87.5 \pm 0.1	based on 9		
Br-O	BrO \rightarrow Br + O	231.0	55.2			Spectroscopic	1958	33
		231.4 \pm 2.5	55.3 \pm 0.6	235.1	56.2	Spectroscopic; extrapola- tion of A ² Π.	1962	6
		231.25	55.27	235.27	56.23	Thermochemical;	1967	
		231.4 \pm 0.4	55.3 \pm 0.1	235.1	56.2 \pm 0.1	based on 9		
C-Br	CH ₃ Br \rightarrow CH ₃ + Br	224.7	53.7			E.I.; M.S.	1959	179
				280	67	($T=1000$ K) pyrolysis	1962	6
				293	70	Analysis of data	1966	8
	279.9	66.9	285.8	68.3	Thermochemical;	1967		
	280 \pm 8	67 \pm 2	285 \pm 8	68 \pm 2	based on 9			
	CH ₂ Br ₂ \rightarrow CH ₂ Br + Br			249.8 \pm 14.6	59.7 \pm 3.5	E.I.; M.S.	1959	179
			261.5	62.5 (at 950 K)	Pyrolysis	1962	6	
			255 \pm 13	61 \pm 3				

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
C—C	$\text{CHBr}_3 \rightarrow \text{CHBr}_2 + \text{Br}$			257.7 ± 17 232.2	61.6 ± 4 55.5	E.I.; M.S. Pyrolysis	1959 1962	179 6
	$\text{CBr}_4 \rightarrow \text{CBr}_3 + \text{Br}$	205 205 ± 13	49 49 ± 3	207.9 205 209 209 ± 13	49.7 49 (at 750 K) 50 50 ± 3	E.I.; M.S. Pyrolysis Thermochemical; based on 9	1959 1962 1967	179 6 6
	$\text{CCl}_3\text{Br} \rightarrow \text{CCl}_3 + \text{Br}$			207.1 ± 12.6 205 230.5 ± 5.0	49.5 ± 3 49 55.1 ± 1.2	($T=400\text{--}500\text{ K}$); E.I.; M.S. ($T=800\text{ K}$), pyrolysis Recalculation of earlier data on photo- bromination.	1962 1962 1965	6 70
		213 213 ± 13	51 51 ± 3	226 ± 8 218 218 ± 13	54 ± 2 52 52 ± 3	Analysis of data Thermochemical; based on 9	1966 1967	8
	$\text{CF}_3\text{Br} \rightarrow \text{CF}_3 + \text{Br}$			272 290.4 ± 3.3	65 69.4 ± 0.8	($T=1050\text{ K}$), pyrolysis Equilibrium $\text{Br}_2 + \text{CF}_3\text{H}$ $= \text{HBr} + \text{CF}_3\text{Br}$	1962 1967	6 15
		276	66	276 285 ± 13	66 68 ± 3	Thermochemical; based on 9	1967	
	$\text{BrCN} \rightarrow \text{CN} + \text{Br}$	377	90	380	91	Thermochemical; based on 9	1967	
	$\text{C}_2 \rightarrow 2\text{C}$	599.1 ± 13 602 ± 21 602 ± 21	143.2 ± 3 144 ± 5 144 ± 5	603.3 607 ± 21	144.2 145 ± 5	M.S. Spectroscopic	1962 1962	6 203
	$\text{CH}_3\text{CN} \rightarrow \text{CH}_3 + \text{CN}$	498 498 ± 21	119 119 ± 5	431 431 506 506 ± 21	103 103 121 121 ± 5	($T=400\text{--}500\text{ K}$); E.I. A.P.; M.S. Thermochemical; based on 9	1962 1959 1967	6 179
	$\text{CH}_2\text{FCN} \rightarrow \text{CH}_2\text{F} + \text{CN}$			~ 460	~ 110	($T=400\text{--}500\text{ K}$); E.I.; M.S.	1960	16
$\text{CHF}_2\text{CN} \rightarrow \text{CHF}_2 + \text{CN}$			485	116	($T=400\text{--}500\text{ K}$); E.I.; M.S.	1960	16	
$\text{CF}_3\text{CN} \rightarrow \text{CF}_3 + \text{CN}$			502	120	($T=400\text{--}500\text{ K}$); E.I.; M.S.	1960	16	

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.	
		0 K		298 K					
		kJ/mol	kcal/mol	kJ/mol	kcal/mol				
C-Cl	$C_2N_2 \rightarrow 2CN$			435	104	A.P.; M.S.	1961	127	
		607	145			Shock wave; thermo-chemical	1961	120	
				523 ± 33	125 ± 8	($T = 1700\text{--}2500\text{ K}$)	1962	164	
				607	145	Shock wave			
				602	144	Analysis of data	1966	8	
	$CH_2CO \rightarrow CH_2 + CO$	598	143			Thermochemical;	1967		
		598 ± 21	143 ± 5	603 ± 21	144 ± 5	based on 9			
		337.2	80.6	342.7	81.9	Thermochemical; based on 9	1967		
		$CH_3CO \rightarrow CH_3 + CO$			44.4	10.6	Analysis of data	1966	8
					47.3	11.3	Thermochemical;	1967	
				46 ± 4	11 ± 1	based on 9			
	$CCl \rightarrow C + Cl$	322	77			Spectroscopic; L. B. S. for ground state.	1961	17	
		335 ± 42	80 ± 10	338.1	80.8	Analysis of data	1961	6	
	$CCl_4 \rightarrow CCl_3 + Cl$			284.1 ± 13	67.9 ± 3	A.P.; M.S.	1956	124	
				301 ± 10	72 ± 2.5	A.P.; M.S.	1958	18	
		337.2	80.6			Based on rate constants; previous data.	1961	141	
				318	76	A.P.; M.S.	1961	19	
				311.7 ± 8	74.5 ± 2	Thermochemical analysis of earlier data on photobromination.	1965	70	
				305 ± 8	73 ± 2	Analysis of data; thermochemical.	1966	8	
		280	67	285	68	Thermochemical; based on 9	1967		
			293 ± 21	70 ± 5					
$CF_3Cl \rightarrow CF_3 + Cl$			347 ± 12	83 ± 3	A.P.; M.S.	1956	124		
			~ 335	~ 80		1962	6		
	335	80	339	81	Thermochemical; based on 9	1967			
			339 ± 13	81 ± 3					
$CH_3Cl \rightarrow CH_3 + Cl$			328	78.4	A.P.; M.S.	1959	179		
			336.8	80.5	($T = 400\text{--}500\text{ K}$); E.I.; M.S.	1962	6		
	318	76			Based on rate constants; previous data	1961	141		
			351 ± 8	84 ± 2	Analysis of data; thermochemical	1966	8		
	335.1	80.1	341.4	81.6	Thermochemical; based on 9	1967			
			339 ± 21	81 ± 5					

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
C-F	CH ₂ Cl ₂ → CH ₂ Cl + Cl			307.9 ± 11.7	73.6 ± 2.8	($T=400\text{--}500$ K); A.P.; M.S.	1959	179
		314 ± 75				Based on rate constants; previous data	1961	141
	CH ₂ Cl → CH ₂ + Cl			318.4 ± 13	76.1 ± 3	A.P.; M. S. (Based on $D(\text{CH—H})=119.9$ Kcal mol ⁻¹).	1959	179
				498	119	Recalculated; based on $D(\text{CH—H})=99.3$ Kcal mol ⁻¹ .	1967	
	ClCN → CN + Cl	435	104	439	105	Thermochemical; based on 9	1967	
	COCl → CO + Cl	26.4	6.3			Based on rate constants; previous data	1961	141
	COCl ₂ → COCl + Cl	328.4	78.5			Based on rate constants; previous data.	1961	141
	CCl ₃ F → CCl ₃ + F			427 ± 29	102 ± 7	($T=400\text{--}500$ K); E.I.; M.S.	1962	6
				448 ± 11.7	107 ± 2.8	Recalculation of earlier data on photobromination	1965	70
				444 ± 13	106 ± 3	Analysis of data	1966	8
		410	98	414	99	Thermochemical; based on 9	1967	
				444 ± 21	106 ± 5			
	CF ₄ → CF ₃ + F			506 ± 10.5	121 ± 2.5	E.I.; M.S.	1958	18
				506 ± 17	121 + 4	E.I.; M.S.	1962	6
	523	125	527	126	Thermochemical; based on 9	1967		
			532.6	127.3	Thermochemical; based on 202	1967		
			523 ± 17	125 ± 4				
	CH ₃ F → CH ₃ + F			494	118	Analysis of data	1962	6
				452 ± 13	108 ± 3	Thermochemical	1966	8
				452 ± 21	108 ± 5			
C-H	CH → C + H	335 ± 4	80 ± 1			Spectroscopic; predissociation	1956	3
		318.4	76.1			Theoretical	1962	134
		335 ± 21	80 ± 5			Spectroscopic; ² II emission	1964	79
		334.7	80.0	338.9	81.0	Thermochemical; based on 9	1967	
				339 ± 2.1	81 ± 0.5			

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
	CH ₂ → CH + H			502	120	A.P.; M.S.	1959	179
		436.4	104.3			Theoretical	1962	134
				536 ± 25	128 ± 6	Analysis of data	1962	6
				< 405.0 ± 9.6	< 96.8 ± 2.3	Recalculation of earlier M.S. data	1963	67
				452 ± 25	108 ± 6	Analysis of data	1966	8
		415.5	99.3	421.7	100.8	Thermochemical; based on 9 and 122.	1967	
	CH ₃ → CH ₂ + H	485	116			Theoretical	1962	134
				356 ± 29	85 ± 7	Analysis of data	1962	6
		< 540	< 129			Recalculation of earlier M.S. data	1963	67
		469.86	112.30			Photoionization	1965	122
		466.5	111.5	435 ± 25	104 ± 6	Analysis of data	1966	8
		469.9 ± 0.4	112.3 ± 0.1	471.1	112.6	Thermochemical; based on 9	1967	
	CH ₄ → CH ₃ + H			473 ± 4	113 ± 1			
				397	95	A.P.; M.S.	1959	179
		423	101			Photobromination	1956	3
				434.7	103.9	Photohalogenation	1961	155
		425.1 ± 8	101.6 ± 2	431 ± 8	103 ± 2	Analysis of data	1962	6
		423	101			Theoretical	1962	134
		425.47 ± 0.21	101.69 ± 0.05			Photoionization	1965	122
				435 ± 4	104 ± 1	Analysis of data	1966	8
				434.3	103.8		1967	
		425.1	101.6	431.8	103.2	Thermochemical; based on 9	1967	
				102.7 ± 2.0				
	CD ₄ → CD ₃ + D	438.99 ± 0.2	104.92 ± 0.05			Photoionization	1965	123
	CBr ₃ H → CBr ₃ + H			389 ± 8	93 ± 2	(<i>T</i> = 400 K); photobromination	1962	6
				377	90	Thermochemical	1962	6
		368 ± 8	88 ± 2	377 ± 8	90 ± 2			
	CH ₃ Br → CH ₂ Br + H	~414	~99			Photobromination	1956	3
		402	96			Thermochemical	1962	6
		406 ± 21	97 ± 5					
CCl ₃ H → CCl ₃ + H			377 ± 8	90 ± 2	Photobromination	1956	3	
			389	93	Rate constant data	1961	141	
			372 ± 13	89 ± 3	(<i>T</i> = 400–500 K); E.I.; M.S.	1962	6	
			389	93	(<i>T</i> = 430 K); photochlorination	1962	6	
			400.4 ± 6.3	95.7 ± 1.5	Recalculation of earlier data on photo-bromination	1965	70	
	372	89	380	91	Thermochemical; based on 9	1967		
	372 ± 13	89 ± 3	377 ± 13	90 ± 3				

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
	$\text{CH}_3\text{CN} \rightarrow \text{CH}_2\text{CN} + \text{H}$ $\text{HCN} \rightarrow \text{H} + \text{CN}$			<331 464 ± 25 540 ± 13	<79 111 ± 6 129 ± 3	A.P.; M.S. Thermochemical Shock wave; Kr + C ₂ N ₂ ; Kr + HCN	1956 1961	3 120
		531 531 ± 21	127 127 ± 5	540 ± 13 540 540 ± 21	129 ± 3 129 129 ± 5	Analysis of data Thermochemical; based on 9	1966 1967	8
	$\text{HCO} \rightarrow \text{H} + \text{CO}$			127.2 ± 9.6	30.4 ± 2.3	($T = 400\text{--}500\text{ K}$); E.I.; M.S.	1962	6
		119.7	28.6	75 124.7	18 29.8	Analysis of data Thermochemical; based on 9	1966 1967	8
	$\text{H}_2\text{CO} \rightarrow \text{HCO} + \text{H}$			<326 314 ± 8 368 ± 8 318	<78 75 ± 2 88 ± 2 76	Photolysis E.I.; M.S. Analysis of data Thermochemical; based on 9	1962 1962 1966 1967	6 6 8
		314	75					
	$\text{CF}_3\text{H} \rightarrow \text{CF}_3 + \text{H}$			431 ± 17 427 ± 8 431 ± 17 458.1 ± 6.3 427 ± 8 443.5 444.8 444 ± 4 444.8 431 444 ± 13	103 ± 4 102 ± 2 103 ± 4 109.5 ± 1.5 102 ± 2 106.0 106.3 106 ± 1 106.3 103 106 ± 3	E.I.; M.S.; $\Delta H_f(\text{CF}_3) = -117 \pm 2$ From $\text{CF}_3 + \text{CH}_4 \rightarrow$ $\text{CF}_3\text{H} + \text{CH}_3$ E.I.; M.S. Photohalogenation $\text{CD}_3 + \text{CF}_3\text{H} \rightarrow \text{CD}_3\text{H} + \text{CF}_3$ $\text{Br} + \text{CF}_3\text{H} = \text{HBr} + \text{CF}_3$; $\text{Br} + \text{CH}_4 = \text{HBr} + \text{CH}_3$ Equilibrium Analysis of data Equilibrium Thermochemical; based on 9	1956 1956 1962 1963 1964 1966 1966 1966 1967 1967	124 138 6 185 175 193 150 8 15
	$\text{CH}_3\text{Cl} \rightarrow \text{CH}_2\text{Cl} + \text{H}$	410	98	372.0 ± 13	88.9 ± 3	Photochlorination	1956 1961	124 141
	$\text{CH}_2\text{Cl}_2 \rightarrow \text{CHCl}_2 + \text{H}$			333.0 ± 21 397	79.6 ± 5 95	E.I.; M.S. Photochlorination	1959 1961	179 141
	$\text{CH}_3\text{CN} \rightarrow \text{CH}_2\text{CN} + \text{H}$			<331	<79	E.I.; M.S.	1961	125
	$\text{CH}_3\text{OH} \rightarrow \text{CH}_2\text{OH} + \text{H}$			385	92	$\text{Br} + \text{CH}_3\text{OH} \rightarrow$ $\text{HBr} + \text{CH}_2\text{OH}$	1962	139

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.		
		0 K		298 K						
		kJ/mol	kcal/mol	kJ/mol	kcal/mol					
C-I	$\text{CH}_3\text{I} \rightarrow \text{CH}_3 + \text{I}$			221.7	53.0	A.P.; M.S.	1959	179		
		230	55			Previous data on $\text{HI} + \text{CH}_3\text{I} = \text{CH}_4 + \text{I}_2$	1961	103		
				220.1	52.6	E.I.	1962	6		
				230 ± 4	55 ± 1	Equilibrium $\text{HI} + \text{CH}_3\text{I} = \text{CH}_4 + \text{I}_2$	1963	65		
		227.2 226 ± 13	54.3 54 ± 3	232.6 232.2 ± 13	55.6 55.5 ± 3	Thermochemical; based on 9	1967			
	$\text{CNI} \rightarrow \text{CN} + \text{I}$	335	80	339	81	Thermochemical; based on 9	1967			
C-N	$\text{CN} \rightarrow \text{C} + \text{N}$			808 728 ± 13	193 174 ± 3	A.P.; M.S. Shock wave; $\text{Kr} + \text{C}_2\text{N}_2$	1961 1961	127 120		
		812 ± 21 723.4 ± 9.6 732 730.1 ± 21	194 ± 5 172.9 ± 2.3 175 174.5 ± 5	816 732 732 ± 21	195 175 175 ± 5	Analysis of various data Effusion; M.S. Thermochemical; based on 9	1962 1962 1967	6 162		
		$\text{CH}_3\text{NH}_2 \rightarrow \text{CH}_3 + \text{NH}_2$			335 331 335 331 ± 13	80 79 80 79 ± 3	A.P.; M.S. Analysis of data Thermochemical; based on 9	1959 1966 1967	128 8	
			$\text{CH}_3\text{NO}_2 \rightarrow \text{CH}_3 + \text{NO}_2$			243 246.9 247 ± 13	58 59.0 59 ± 3	Analysis of data Thermochemical; based on 9	1962 1967	6
					238.9	57.1				
	$\text{CO} \rightarrow \text{C} + \text{O}$		1070.23 1071.77 1071.94 ± 0.4	255.79 256.16 256.2 ± 0.1	1074.83 1076.38 1076.5 ± 0.4	256.89 257.26 257.3 ± 0.1	Analysis of data Thermochemical; based on 9	1962 1967	6	
		$\text{CO}_2 \rightarrow \text{CO} + \text{O}$	526.14 526.14 525.9 ± 0.4	125.75 125.75 125.7 ± 0.1	532.20 532.16 532.2 ± 0.4	127.20 127.19 127.2 ± 0.1	Thermochemical Thermochemical; based on 9	1962 1967	6	
			$\text{CH}_3\text{OH} \rightarrow \text{CH}_3 + \text{OH}$	374.5	89.5				1956	132
						381.2 ~ 377 381 ± 8	91.1 ~ 90 91 ± 2	A.P.; M.S. Photodissociation Thermochemical	1959 1962 1966	179 6 8
		370.7 370.3 ± 13		88.6 88.5 ± 3	378.7 377 ± 13	90.5 90 ± 3	Thermochemical; based on 9	1967		
		$\text{HCOOH} \rightarrow \text{CHO} + \text{OH}$				~ 377 400.4 402 ± 13	~ 90 95.7 96 ± 3	Photodissociation Thermochemical; based on 9	1962 1967	6

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
C-S	$\text{CH}_3\text{COOH} \rightarrow \text{CH}_3\text{CO} + \text{OH}$			~ 377 452.3 452 ± 21	~ 90 108.1 108 ± 5	Photodissociation Thermochemical; based on 9	1962 1967	6
	$\text{OCS} \rightarrow \text{CS} + \text{O}$	619	148	628	150	Thermochemical; based on 9	1967	
	$\text{CS} \rightarrow \text{C} + \text{S}$	757 \pm 151	181 \pm 36			Spectroscopic; L.B.S. for $X^1\Sigma$ state	1959	20
		735.5 757 \pm 21	175.8 181 \pm 5	740.1 761 \pm 21	176.9 182 \pm 5	Thermochemical	1962	6
	$\text{OCS} \rightarrow \text{CO} + \text{S}$	305.0	72.9	310.5	74.2	Thermochemical; based on 9	1967	
	$\text{CS}_2 \rightarrow \text{CS} + \text{S}$	389	93	397	95	Thermochemical; based on 9	1967	
	$\text{CH}_3\text{S} \rightarrow \text{CH}_3 + \text{S}$			289	69		1962	137
	$\text{CH}_3\text{SH} \rightarrow \text{CH}_3 + \text{SH}$			305 \pm 21 293 \pm 21	73 \pm 5 70 \pm 5	Thermochemical; $\Delta H_f(\text{SH}) = 35.0$ ($T = 400^\circ\text{--}500^\circ$); E.I.; M.S.	1962 1962	135 6
		297 297 \pm 13	71 71 \pm 3	305 305 \pm 13	73 73 \pm 3	Thermochemical; based on 9	1967	
	$\text{CH}_3\text{SO}_2 \rightarrow \text{CH}_3 + \text{SO}_2$			97.5 \pm 7.5	23.3 \pm 1.8	Thermochemical	1961	142
Ca-Cl	$\text{CaCl} \rightarrow \text{Ca} + \text{Cl}$	< 266.1	< 63.6			Spectroscopic; predissociation.	1962	6
		335 \pm 42 427 \pm 25 427 \pm 42	80 \pm 10 102 \pm 6 102 \pm 10			Calorimetric Flame photometry	1963 1965	186 23
	$\text{CaCl}_2 \rightarrow \text{CaCl} + \text{Cl}$	431 \pm 42 431 \pm 42	103 \pm 10 103 \pm 10			Flame photometry	1965	23
Ca-F	$\text{CaF} \rightarrow \text{Ca} + \text{F}$	< 303.8	< 72.6			Spectroscopic; predissociation.	1962	6
		515 \pm 19 565 \pm 29 552 \pm 42	123 \pm 4.6 135 \pm 71 132 \pm 10			Effusion; M.S.	1963	174

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Ca-O	$\text{CaF}_2 \rightarrow \text{CaF} + \text{F}$	548 ± 42	131 ± 10			Flame photometry; recalculated from ref. 21.	1965	23
		569	136			Flame photometry	1964	21
		548 ± 42	131 ± 10					
	$\text{CaO} \rightarrow \text{Ca} + \text{O}$	481 ± 17	115 ± 4			Analysis of data on flames	1962	6
		347 ± 42	83 ± 10			Theoretical	1964	144
		389 ± 21	93 ± 5			Effusion; M.S.	1964	190
		353.1 ± 25	84.4 ± 6			Effusion; M.S.	1964	189
		382.0 ± 5.9	91.3 ± 1.4			Flame photometry; CO flame	1965	71
		490 ± 21	117 ± 5			Flame photometry; H ₂ flame	1965	22
		531 ± 21	127 ± 5			Flame photometry; H ₂ flame	1966	191
		460 ± 84	110 ± 20					
	$\text{CaOH} \rightarrow \text{Ca} + \text{OH}$	$\leq 397 \pm 42$	$\leq 95 \pm 10$			Flame photometry; C ₂ H ₂ + CO flames	1957	52
		418 ± 33	100 ± 8			Flame photometry; H ₂ flame	1965	22
	$\text{Ca(OH)}_2 \rightarrow \text{CaOH} + \text{OH}$	490 ± 75	117 ± 18			Ref 191 gives $D_1 + D_2 = 217 \pm 10$ and 22 gives $D_2 = 100 \pm 8$		
Ca-S	$\text{CaS} \rightarrow \text{Ca} + \text{S}$	289 ± 19	69 ± 4.6			M.S.	1962	6
		332.6 ± 9.6	79.5 ± 2.3			M.S.; Effusion of Ca + S ₂ = CaS + S	1963	80
		308.4 ± 18.8 310 ± 21	73.7 ± 4.5 74 ± 5			M.S.; Effusion	1964	189
Cd-S	$\text{CdS} \rightarrow \text{Cd} + \text{S}$	≤ 377	≤ 90	381	91	Spectroscopic; limit of continuum	1953	1
		≤ 197	≤ 47			M.S.	1963	80
Cl-Cl	$\text{Cl}_2 \rightarrow 2\text{Cl}$	238.9 ± 0.25	57.10 ± 0.06	242.3	57.9	Spectroscopic	1962	6
		239.99	57.36	243.34	58.16	Thermochemical; based on 9	1967	
		239.7 ± 0.4	57.3 ± 0.1					
Cl-F	$\text{ClF} \rightarrow \text{Cl} + \text{F}$	246.9 ± 0.8	59.0 ± 0.2	250.2	59.8	Spectroscopic; convergence of bands	1962	6
		251.5	60.1	255.2	61.0	Thermochemical; based on 9	1967	
		248.9 ± 2.1	59.5 ± 0.5					

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Cl-H	$\text{O}_3\text{ClF} \rightarrow \text{O}_3\text{Cl} + \text{F}$			251 255	60 61	A.P.; M.S. Thermochemical	1957 1962	60 6
	$\text{HCl} \rightarrow \text{H} + \text{Cl}$	427.60 \pm 1.46 424.7 428.15 428.02 \pm 0.42	102.20 \pm 0.35 101.5 102.33 102.3 \pm 0.1	431.45 431.96	103.12 103.24	Thermochemical Theoretical Thermochemical; based on 9	1962 1963 1967	6 188
	$\text{ClO} \rightarrow \text{Cl} + \text{O}$	246.9 265.01 \pm 0.13 264.85 267.8 \pm 4.2	63.31 63.34 \pm 0.03 63.30 64 \pm 1	269.16 269.03	64.33 64.30	Spectroscopic Spectroscopic; convergence of bands. Thermochemical; based on 9	1958 1962 1967	33 6
	$\text{ClO}_2 \rightarrow \text{ClO} + \text{O}$	267 241.0 \pm 6.3 230 \pm 8 243.9 243 \pm 13	66 57.6 \pm 1.5 55 \pm 2 58.3 58 \pm 3	278.2 245.6 248.5	66.5 58.7 59.4	Spectroscopic; predissociation Thermochemical E.I.; M.S. Thermochemical; based on 9	1962 1962 1967 1967	6 6 27
Co-Co	$\text{ClO}_3 \rightarrow \text{ClO}_2 + \text{O}$			199.2 197.1 201 \pm 4	47.6 47.1 48 \pm 1	Thermochemical Thermochemical; based on 9	1962 1967	6
	$\text{Cl}_2\text{O} \rightarrow \text{Cl} + \text{ClO}$	142.7 139.3 139.3 \pm 4	34.1 33.3 33.3 \pm 1	146.4 143.1	35.0 34.2	Thermochemical Thermochemical; based on 9	1962 1967	6
	$\text{Co}_2 \rightarrow 2\text{Co}$	163 \pm 25 163 164.0 \pm 17	39 \pm 6 39 39.2 \pm 4	167	40	Effusion; M.S. Thermochemical; based on 9	1964 1967	56
	$(\text{CO})_4\text{Co}-\text{Co}(\text{CO})_4 \rightarrow 2\text{Co}(\text{CO})_4$			48.1 \pm 19.2	11.5 \pm 4.6	A.P.; M.S.	1967	187
Cr-Cr	$\text{Cr}_2 \rightarrow 2\text{Cr}$	< 167 < 184	< 40 < 44	< 172	< 41	M.S. Effusion; M.S.	1962 1964	62;6 56
Cr-O	$\text{CrO} \rightarrow \text{Cr} + \text{O}$	425.5 \pm 29 418 423 \pm 29	101.7 \pm 7 100 101 \pm 7			Effusion; M.S. Thermochemical; based on 9	1961 1967	85

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
	$\text{CrO}_2 \rightarrow \text{CrO} + \text{O}$	527 ± 63 527 531 ± 63	126 ± 15 126 126 ± 15			Effusion; M.S. Thermochemical; based on 9	1961 1967	85
	$\text{CrO}_3 \rightarrow \text{CrO}_2 + \text{O}$	477 ± 84	114 ± 20			Effusion; M.S.	1961	85
Cs-Br	$\text{CsBr} \rightarrow \text{Cs} + \text{Br}$			381	91	Effusion; Ioni- zation on hot wire M.S.	1962 1962	163 6
		416.3 ± 13	99.5 ± 3					
Cs-Cl	$\text{CsCl} \rightarrow \text{Cs} + \text{Cl}$	422.2	100.9	425.9	101.8	Effusion; Ioni- zation on hot wire	1962	163
		425.1 ± 13	101.6 ± 3	428.9	102.5	Thermochemical	1962	6
		448 ± 13	107 ± 3			Flame photometry	1962	6
		435 ± 21	104 ± 5					
Cs-F	$\text{CsF} \rightarrow \text{Cs} + \text{F}$	481	115	485	116	Effusion; Ioni- zation on hot wire	1962	163
		481 ± 25	115 ± 6	485	116	Thermochemical	1962	6
		515 ± 33	123 ± 8			Flame photometry	1962	6
		487.4	116.5			Theoretical	1963	188
		502 ± 42	120 ± 10					
Cs-I	$\text{CsI} \rightarrow \text{Cs} + \text{I}$	315.5	75.4	319.2	76.3	Effusion; Ioni- zation on hot wire	1962	163
		350.2 ± 17	83.7 ± 4	354.0	84.6	Flame photometry	1962	6
		335 ± 21	80 ± 5					
Cs-O	$\text{CsOH} \rightarrow \text{Cs} + \text{OH}$	381 ± 13	91 ± 3			Flame photometry	1966	192
Cu-Cu	$\text{Cu}_2 \rightarrow 2\text{Cu}$	201 ± 38	48 ± 9			Spectroscopic; L.B.S. for ground state.	1962	6
		190.4 ± 9.2	45.5 ± 2.2			M.S.	1960; 1962	108; 6
		190.4 ± 13	45.5 ± 3					
Cu-F	$\text{CuF} \rightarrow \text{Cu} + \text{F}$	293 ± 96	70 ± 23	297	71	Spectroscopic; L.B.S. for ground state	1953; 1962	3; 6
		364 ± 38	87 ± 9			Effusion; M.S.	1966	151
	$\text{CuF}_2 \rightarrow \text{CuF} + \text{F}$	366.5	87.6			Effusion; M.S.	1966	151

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Cu-H	$\text{CuH} \rightarrow \text{Cu} + \text{H}$	276 ± 8	66 ± 2	280	67	Flame photometry	1956;	136;
				264	63	Thermochemical; based on 9	1962 1967	6
Cu-Sn	$\text{CuSn} \rightarrow \text{Cu} + \text{Sn}$	173.2 ± 17	41.4 ± 4	177.4	42.4	Effusion; M.S.	1962	63; 6
		173.4	41.4			Thermochemical;	1967	
		173.4 ± 17	41.4 ± 4			based on 9		
F-F	$\text{F}_2 \rightarrow 2\text{F}$	153.1	36.6			Thermochemical; M.S.	1956	89
		155.2 ± 3.6	37.1 ± 0.85			Spectroscopic; continuous absorption	1957	94
		172.8 ± 2.1	41.3 ± 0.5			Molecular beam: magnetic detection	1959	129
		154.8 ± 4	37.0 ± 1	159.0	38.0	Dissociation equilibrium	1962	6
		161.1 ± 2.5	38.5 ± 0.6	165.3	39.5	Thermochemical	1962	6
		170.54	40.76	174.9 ± 0.8	41.8 ± 0.2	Effusion; Knudsen cell	1966	167
		153.80	36.76	157.99	37.76	Thermochemical;	1967	
		154.8 ± 4	37.0 ± 1.0			based on 9		
F-H	$\text{HF} \rightarrow \text{H} + \text{F}$	565.3 ± 1.3	135.1 ± 0.3	566.1	135.3	Spectroscopic; extrapolation of $X^1\Sigma$ levels	1959	28
		556.1	132.9			Theoretical	1963	188
		561.1	134.1			Shock tube	1965	74
		564.0	134.8	568.2	135.8	Thermochemical;	1967	
		565 ± 4	135 ± 1			based on 9		
F-O	$\text{FO} \rightarrow \text{F} + \text{O}$	106.3	25.4			A.P.; M.S.	1957	106
		184 ± 42	44 ± 10	189	45.1	Assumed $D_0(\text{F-O})$ $= 1/2D_0(\text{F}_2\text{O})$	1962	6
		151	36	155	37	Thermochemical; based on 9	1967	
	155 ± 13	37 ± 3						
	$\text{FOO} \rightarrow \text{F} + \text{O}_2$	63	15			Thermal decom- position of F_2O_2	1965	43
	$\text{F}_2\text{O} \rightarrow \text{FO} + \text{F}$	270.3	64.6			A.P.; M.S.	1957	106
		269.9	64.5	274.5	65.6	E.I.; M.S.	1962	66
		180 ± 42	43 ± 10	186.2	44.5	Estimated	1962	6
		268	64	272	65	Thermochemical;	1967	
268 ± 13		64 ± 3			based on 9			
$\text{F}_2\text{O}_2 \rightarrow \text{FO}_2 + \text{F}$	77.8	18.4			A.P.; M.S.	1966	152	

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.				
		0 K		298 K								
		kJ/mol	kcal/mol	kJ/mol	kcal/mol							
Fe-Fe	$\text{Fe}_2\text{Br}_4 \rightarrow 2\text{FeBr}_2$			145.2 ± 17 158.2	34.7 ± 4 37.8	Effusion; M.S. Equilibrium studies	1959 1962	100 6				
				172 167 ± 17	41 40 ± 4	Thermochemical; based on 9	1967					
		$\text{Fe}_2\text{Cl}_4 \rightarrow 2\text{FeCl}_2$	134 ± 13	32 ± 2	151.9	36.3	Effusion; M.S. Equilibrium studies	1958 1962	118 6			
	142 146 ± 13				34 35 ± 3	Thermochemical; based on 9	1967					
	Fe-Br				$\text{FeBr}_3 \rightarrow \text{FeBr}_2 + \text{Br}$	222 188 188 ± 21	53 45 45 ± 5	Thermochemical Thermochemical; based on 9	1962 1967	6		
		Fe-Cl	$\text{FeCl}_3 \rightarrow \text{FeCl}_2 + \text{Cl}$	209 227.2 226 ± 8		50 54.3 54 ± 2	Thermochemical Thermochemical; based on 9	1962 1967	6			
Fe-I				$\text{FeI}_3 \rightarrow \text{FeI}_2 + \text{I}$		144 96	34.4 23	Equilibrium studies Thermochemical; based on 9	1962 1967	6		
	Fe-S				$\text{FeS} \rightarrow \text{Fe} + \text{S}$	≤ 315.9	≤ 75.5	M.S.; $\text{Fe} + \text{S}_2 = \text{FeS} + \text{S}$	1963	80		
Ga-Br	$\text{GaBr} \rightarrow \text{Ga} + \text{Br}$	415.5 ± 0.4 429.3 ± 17 435 435 ± 17	99.3 ± 0.1 102.6 ± 4 104 104 ± 4	419.7 439 444 ± 17	100.3 105 106 ± 4	Spectroscopic Flame photometry Thermochemical; based on 9	1960 1962 1967	140 6				
		Ga-Cl	$\text{GaCl} \rightarrow \text{Ga} + \text{Cl}$	474.9 ± 4 480.7 ± 17 477 477 ± 13	113.5 ± 1 114.9 ± 4 114 114 ± 3	478.2 477	114.3 114	Spectroscopic Flame photometry Thermochemical; based on 9	1960 1962 1967	140 6		
				Ga-F	$\text{GaF} \rightarrow \text{Ga} + \text{F}$	602.1 ± 21 577 ± 15 602 602 ± 13	143.9 ± 5 138 ± 3.5 144 144 ± 3	605.8 607	144.8 145	Spectroscopic Effusion; M.S. Thermochemical; based on 9	1960 1966 1967	140 170

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.	
		0 K		298 K					
		kJ/mol	kcal/mol	kJ/mol	kcal/mol				
Ga-Ga	$\text{Ga}_2 \rightarrow 2\text{Ga}$	≤ 146	≤ 35	151	36	M.S.	1957	30;	
		113 113 ± 17	27 27 ± 4	117 117 ± 17	28 28 ± 4	Thermochemical; based on 9	1967	29	
Ga-H	$\text{GaH} \rightarrow \text{Ga} + \text{H}$	272	65	276	66	Thermochemical; based on 9	1967		
Ga-I	$\text{GaI} \rightarrow \text{Ga} + \text{I}$	335	80			Spectroscopic Flame photometry Thermochemical; based on 9	1960	140	
		381 ± 29	91 ± 7				1962	6	
		351	84	356	85		1967		
		351 ± 21	84 ± 5	356 ± 21	85 ± 5				
Ga-O	$\text{GaO} \rightarrow \text{Ga} + \text{O}$	343 ± 50	58 ± 12			Spectroscopic; L.B.S. for ground state Spectroscopic Estimate	1953	3	
		293 ± 42	70 ± 10	297	71		1962	6	
		347	83	351	84		1962	6	
		243	58	247	59		1967		
		247 ± 42	59 ± 10		Thermochemical; based on 9				
	$\text{GaOH} \rightarrow \text{Ga} + \text{OH}$	427 ± 21	102 ± 5			Flame photometry Thermochemical; based on 9	1958	196	
		427	102	431	103		1967		
		431 ± 21	103 ± 5						
	Ge-Br	$\text{GeBr} \rightarrow \text{Ge} + \text{Br}$	251 ± 29	60 ± 7	255	61	Spectroscopic; extrapolation of ^2I state	1953	3; 6
								1962	
		251	60	251	60	Thermochemical; based on 9	1967		
		251 ± 29	60 ± 7						
	$\text{GeBr}_2 \rightarrow \text{GeBr} + \text{Br}$			410	98	Thermochemical; based on 9	1967		
Ge-C	$\text{GeC} \rightarrow \text{Ge} + \text{C}$	456 ± 21	109 ± 5			M.S. Thermochemical; based on 9	1959	123	
		456	109	460	110		1967		
Ge-Cl	$\text{GeCl} \rightarrow \text{Ge} + \text{Cl}$	339 ± 21	81 ± 5	343	82	Spectroscopic; extrapolation of $^2\Delta$ levels	1953	3; 6	
							1962		
			339	81	343	82	Thermochemical; based on 9	1967	
		339 ± 21	81 ± 5	343 ± 21					

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Ge-F	$\text{GeF} \rightarrow \text{Ge} + \text{F}$	477 ± 84	114 ± 20	481	115	Spectroscopic; L.B.S. for $X^2\Pi$ Thermochemical; based on 9	1962	6
		485	116	490	117		1967	
		484 ± 42	115 ± 10					
	$\text{GeF}_2 \rightarrow \text{GeF} + \text{F}$	548	131			Thermochemical; based on 9	1967	
Ge-Ge	$\text{Ge}_2 \rightarrow 2\text{Ge}$	268 ± 21	64 ± 5			Effusion; M.S. Thermochemical; based on 9	1959	123
		276	66	280	67		1967	
		272 ± 21	65 ± 5	280 ± 21	67 ± 5			
	$\text{Ge}_2\text{H}_6 \rightarrow 2\text{GeH}_3$			142	34	Pyrolysis A.P.; M.S.	1962	6
		315.9	75.5				1966	153
Ge-H	$\text{GeH} \rightarrow \text{Ge} + \text{H}$	318	76	322	77	Thermochemical	1962	6
	$\text{GeH}_4 \rightarrow \text{GeH}_3 + \text{H}$	365	87.2			A.P.; M.S.	1966	153
Ge-O	$\text{GeO} \rightarrow \text{Ge} + \text{O}$	657 ± 17	157 ± 4			L.B.S. for $X^1\Sigma$ Thermochemical Thermochemical; based on 9	1962	6
		665 ± 17	159 ± 4	669	160		1962	6
		665	159	674	161		1967	
		669 ± 21	160 ± 5	674 ± 21	161 ± 5			
Ge-S	$\text{GeS} \rightarrow \text{Ge} + \text{S}$	544 ± 13	130 ± 3	548	131	Spectroscopic; extrapolation of E state levels. Thermochemical; based on 9	1962	6
		556	133	565	135		1967	
		556 ± 17	133 ± 4	561 ± 17	134 ± 4			
Ge-Se	$\text{GeSe} \rightarrow \text{Ge} + \text{Se}$	479.1 ± 25	114.5 ± 6	482.8	115.4	Spectroscopic; extrapolation of E state levels. Thermochemical; based on 9	1962	6
		502	120	506	121		1967	
		502 ± 25	120 ± 6	506 ± 25	121 ± 6			
Ge-Si	$\text{GeSi} \rightarrow \text{Ge} + \text{Si}$	297 ± 21	71 ± 5			Effusion; M.S. Thermochemical; based on 9	1959	123
		297	71	301	72		1967	
		297 ± 17	71 ± 4	301 ± 17	72 ± 4			
	$\text{H}_3\text{GeSiH}_3 \rightarrow \text{GeH}_3 + \text{SiH}_3$	418.0	99.9			M.S.	1966	153

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Ge-Te	GeTe \rightarrow Ge + Te	393 ± 42	94 ± 10	397	95	Spectroscopic; extrapolation of E state	1962	6
		398 ± 17	95 ± 4			Spectroscopic; thermochemical	1964	72
		393	94	397	95	Thermochemical; based on 9	1967	
		393 ± 21	94 ± 5	397 ± 21	95 ± 5			
	GeTe ₂ \rightarrow GeTe + Te			188	45	Thermochemical; based on 9	1967	
H-H	H ₂ \rightarrow 2H	432.027	103.257	436.0	104.2	Spectroscopic	1960	31
		± 0.004	± 0.001					
		432.195	103.297			Theoretical	1966	195
		432.00	103.25	435.93	104.19	Thermochemical; based on 9	1967	
		432.00	103.25					
		± 0.04	± 0.01					
	HD \rightarrow H + D	435.458	104.077			Spectroscopic	1960	31
		435.642	104.121			Theoretical	1966	195
		435.43	104.07	439.32	105.00	Thermochemical; based on 9	1967	
		435.43	104.07					
		± 0.04	± 0.01					
	D ₂ \rightarrow 2D	439.567	105.059			Spectroscopic	1960	31
		439.747	105.102			Theoretical	1966	195
		439.53	105.05	443.34	105.96	Thermochemical; based on 9	1967	
		439.53	105.05					
		± 0.04	± 0.01					
Hf-O	HfO \rightarrow Hf + O	764.0	182.6 ± 6			Effusion; M.S.	1963	92
		772	184.6			Thermochemical; based on 9	1967	
		774 ± 21	185 ± 5					
Hg-Br	HgBr \rightarrow Hg + Br			71	17	Toluene carrier pyrolysis	1956	154
		68.6	16.4	72.8	17.4	Spectroscopic; extrapolation of ground state	1960	32
		68.6 ± 4	16.4 ± 1	72.6 ± 4	17.4 ± 1			
Hg-Cl	HgCl \rightarrow Hg + Cl			96	23	Toluene carrier pyrolysis	1956	154
		96 ± 8	23 ± 2	100	24	Spectroscopic; L.B.S. for ground state	1950	4
		96 ± 8	23 ± 2	100 ± 8	24 ± 2			

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Hg-S	$\text{HgS} \rightarrow \text{Hg} + \text{S}$	268 ± 21	64 ± 5	272	65	Spectroscopic; limit of continuum M.S.	1953	1
		≤ 208.8	≤ 49.9				1963	80
I-Br	$\text{IBr} \rightarrow \text{I} + \text{Br}$	175.381	41.917	177.8	42.5	Spectroscopic	1962	6
		± 0.063	± 0.015			Thermochemical; based on 9	1967	
		175.39	41.92	177.90	42.52			
		175.3 ± 0.4	41.9 ± 0.1	177.8 ± 0.4	42.5 ± 0.1			
I-Cl	$\text{ICl} \rightarrow \text{I} + \text{Cl}$	208.28 ± 0.4	49.78 ± 0.1	211.3	50.5	Spectroscopic; convergence of bands Thermochemical; based on 9	1962	6
		207.82	49.67	210.75	50.37		1967	
		207.9 ± 0.4	49.7 ± 0.1	211.3 ± 0.4	50.5 ± 0.1			
I-F	$\text{IF} \rightarrow \text{I} + \text{F}$	277.0 ± 5.0	66.2 ± 1.2	280	67	Spectroscopic; graphical extrapolation of $\text{B}_3\Pi$ Thermochemical; based on 9	1962	6
		277.86	66.41	281.50	67.78		1967	
		277.8 ± 4	66.4 ± 1	280 ± 4	67 ± 1			
I-H	$\text{HI} \rightarrow \text{H} + \text{I}$	294.60 ± 0.42	70.41 ± 0.1	298.3	71.3	Thermochemical Theoretical Thermochemical; based on 9	1962	6
		290.4	69.4				1963	188
		294.60	70.41	298.32	71.30		1967	
		294.6 ± 0.4	70.4 ± 0.1	298.3 ± 0.4	71.3 ± 0.1			
I-I	$\text{I}_2 \rightarrow 2\text{I}$	148.808 ± 0.13	35.566 ± 0.03	151.0	36.1	Spectroscopic; band convergence Thermochemical; based on 9	1962	6
		148.963	35.603	151.239	36.147		1967	
		148.95 ± 0.04	35.60 ± 0.01					
I-O	$\text{IO} \rightarrow \text{I} + \text{O}$	176 ± 21	42 ± 5			Spectroscopic; B.S. extrapolation Flame photometry Spectroscopy; L.B.S. for $\text{X}^2\Pi$ and $\text{A}^2\Pi$ Thermochemical; based on 9	1958	33
		239 ± 25	57 ± 6				1961	143
		184 ± 21	44 ± 5	188	45		1962	6
		177.0	42.3	180.7	43.2		1967	
		180 ± 21	43 ± 5	184 ± 21	44 ± 5			

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
In-Br	$\text{InBr} \rightarrow \text{In} + \text{Br}$	385 ± 3	92 ± 0.7			Spectroscopic; thermochemical Flame photometry Thermochemical; based on 9	1960	140
		387.9 ± 13	92.7 ± 3				1961	34
		409.6	97.9	412.1	98.5		1967	
		406 ± 21	97 ± 5	414 ± 21	99 ± 5			
In-Cl	$\text{InCl} \rightarrow \text{In} + \text{Cl}$	428.4 ± 8	102.4 ± 2			Spectroscopic; thermochemical Flame photometry Thermochemical; based on 9	1960	140
		434.7 ± 13	103.9 ± 3				1961	34
				439	105		1967	
		435 ± 8	104 ± 2	439 ± 8	105 ± 2			
In-F	$\text{InF} \rightarrow \text{In} + \text{F}$	526.8 ± 8	125.9 ± 2			Spectroscopic Flame photometry Thermochemical; based on 9	1960	140
		523 ± 33	125 ± 8				1961	34
		522.2	124.8	525.5	125.6		1967	
		523 ± 8	125 ± 2	525 ± 8	126 ± 2			
In-H	$\text{InH} \rightarrow \text{In} + \text{H}$	< 238	< 57			Spectroscopic; predissociation Thermochemical; based on 9	1950	4
		243	58	247	59		1967	
		238 ± 21	57 ± 5					
In-I	$\text{InI} \rightarrow \text{In} + \text{I}$	331 ± 4	79 ± 1			Spectroscopic; analysis of data Flame photometry Thermochemical; based on 9	1960	140
		326 ± 17	78 ± 4				1961	34
		340.6	81.4	342.7	81.9		1967	
		339 ± 17	81 ± 4					
In-In	$\text{In}_2 \rightarrow 2\text{In}$	93.7 ± 10.5	22.4 ± 2.5			Effusion; M.S. Thermochemical; based on 9	1959	82
		103.8	24.8	105.9	25.3		1967	
		100 ± 13	24 ± 3	100 ± 13	24 ± 3			
In-O	$\text{InO} \rightarrow \text{In} + \text{O}$	96 ± 42	23 ± 10			Spectroscopic; L.B.S. for ground state Thermochemical; estimate	1953	1
		314	75	318	76		1962	6
		< 318	< 76				1963	66
		105	25	105	25		1967	
	$\text{InOH} \rightarrow \text{In} + \text{OH}$	360 ± 29	86 ± 7			Flame photometry Thermochemical; based on 9	1958	196
		360	86	360	86		1967	
		360 ± 21	86 ± 5	360 ± 21	86 ± 5			
In-S	$\text{InS} \rightarrow \text{In} + \text{S}$			146	35	Thermochemical; based on 9	1967	
In-Sb	$\text{InSb} \rightarrow \text{In} + \text{Sb}$	148.1 ± 10.5	35.4 ± 2.5			Effusion; M.S. Thermochemical; based on 9	1959	82
				161.1	38.5		1967	

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
K-Br	KBr \rightarrow K + Br	379.1 ± 4 379.5 ± 8 378.7 ± 8	90.6 ± 1 90.7 ± 2 90.5 ± 2	382.8 382.8 ± 8	91.5 91.5 ± 2	Thermochemical Flame photometry	1953 1961	3 34
K-Cl	KCl \rightarrow K + Cl	416.7 ± 8 423.4 ± 1.7 394 423 ± 8	99.6 ± 2 101.2 ± 0.4 94.1 101 ± 2	425.9 427 ± 8	101.8 102 ± 2	Flame photometry Thermochemical Theoretical	1961 1962 1963	34 6 188
K-F	KF \rightarrow K + F	490 ± 34 492.9 ± 5.0 494 490 ± 21	117 ± 8 117.8 ± 1.2 118 117 ± 5	496.2 494 ± 21	118.6 118 ± 5	Flame photometry Thermochemical Theoretical	1961 1962 1963	34 6 188
K-I	KI \rightarrow K + I	336.4 322 ± 13 322 326 ± 13	80.4 77 ± 3 77 78 ± 3	326 331 ± 13	78 79 ± 3	Flame photometry Thermochemical Theoretical	1961 1962 1963	34 6 188
K-O	KOH \rightarrow K + OH	339 ± 8	81 ± 2	369.4	88.3	Thermochemical Flame photometry	1962 1966	6 192
La-La	La ₂ \rightarrow 2La	241.0 ± 21	57.6 ± 5			M.S.; photoionization	1963	93
La-O	LaO \rightarrow La + O	786.2 ± 35.6 779.5 ± 19.2 782 ± 21	187.9 ± 8.5 186.3 ± 4.6 187 ± 5			Effusion; M.S. Effusion; M.S.	1956 1961	197 96
La-S	LaS \rightarrow La + S	573 ± 25	137 ± 6			Effusion; M.S.	1965	145
Li-Br	LiBr \rightarrow Li + Br	420.9 ± 13 418 ± 13 418 ± 21	100.6 ± 3 100 ± 3 100 ± 5	423 423 ± 21	101 101 ± 5	Flame photometry Thermochemical	1961 1962	34 6
Li-Cl	LiCl \rightarrow Li + Cl	462.3 ± 13 470.7 ± 4.6 483.3 464 ± 13	110.5 ± 3 112.5 ± 1 115.5 111 ± 3	474.5 469 ± 13	113.4 112 ± 3	Flame photometry Thermochemical Theoretical	1961 1962 1963	34 6 188
Li-F	LiF \rightarrow Li + F	569 ± 34 574.9 ± 5.0 590 573 ± 21	136 ± 8 137.4 ± 1.2 141 137 ± 5	578.6 577 ± 21	138.3 138 ± 5	Flame photometry Thermochemical Theoretical	1961 1962 1963	34 6 188

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.	
		0 K		298 K					
		kJ/mol	kcal/mol	kJ/mol	kcal/mol				
Li-I	$\text{LiI} \rightarrow \text{Li} + \text{I}$	344.3 ± 13	82.3 ± 3			Flame photometry Thermochemical Theoretical	1961	34	
		349.8 ± 13	83.6 ± 3	354.0	84.6		1962	6	
		341.0	81.5				1963	188	
		347 ± 13	83 ± 3	351 ± 13	84 ± 3				
Li-O	$\text{LiO} \rightarrow \text{Li} + \text{O}$	341.0	81.5			Effusion; M.S. M.S.; LiO, Li ₂ O	1959	99	
		326 ± 21	78 ± 5	331	79		1962	6	
		331 ± 13	79 ± 3	335 ± 13	80 ± 3				
	$\text{LiOH} \rightarrow \text{Li} + \text{OH}$	434.3	103.8	439.3	105.0	M.S. Flame photometry Flame photometry Flame photometry	1960	35	
		427	102	432	103.2		1962	6	
		411.3	98.3	416.3	99.5		1962	6	
		423 ± 8	101 ± 2				1966	192	
		423 ± 21	101 ± 5	427 ± 21	102 ± 5				
	Mg-F	$\text{MgF} \rightarrow \text{Mg} + \text{F}$	502 ± 84	120 ± 20	506	121	Spectroscopic; extrapolation of X ² Σ, A ² Π and B ² Σ M.S.; Effusion; 2MgF = Mg + MgF ₂ M.S.; Effusion; AlF ₃ + 2Mg = 2MgF + AlF	1962	6
			441.4 ± 5.0	105.5 ± 1.2				1964	68
			448.9 ± 6.7	107.3 ± 1.6				1964	68
			460 ± 42	110 ± 10					
$\text{MgF}_2 \rightarrow \text{MgF} + \text{F}$		540 ± 84	129 ± 20	544	130	Thermochemical M.S.; Effusion; AlF ₃ + 2Mg = 2MgF + AlF	1962	6	
		582.4 ± 25	139.2 ± 6				1964	68	
		565 ± 42	135 ± 10						
Mg-O		$\text{MgO} \rightarrow \text{Mg} + \text{O}$	410 ± 8	98 ± 2			Flame photometry Flame photometry Transpiration in O ₂ Transpiration in O ₂ Theoretical M.S.; Effusion	1959	177
			418 ± 13	100 ± 3				1962	6
			335	80				1963	36
			389	93				1963	37
			42 ± 42	10 ± 10				1964	144
	360 ± 21		86 ± 5			1964		190	
	377 ± 42		90 ± 10						
	$\text{MgOH} \rightarrow \text{Mg} + \text{OH}$	234 ± 21	56 ± 5			Flame photometry	1959	177	
	Mn-Br	$\text{MnBr} \rightarrow \text{Mn} + \text{Br}$	280 ± 54	67 ± 13			Spectroscopic; L.B.S. of ground state Flame photometry	1950	4
			310.5 ± 8	74.2 ± 2				1961	34
			293 ± 21	70 ± 5					

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Mn-Cl	$\text{MnCl} \rightarrow \text{Mn} + \text{Cl}$	318 ± 63	76 ± 15			Spectroscopic; L.B.S. of ground state	1950	4
		356.9 ± 8	85.3 ± 2	360.7	86.2	Flame photometry	1961	34
		335 ± 42	80 ± 10					
Mn-I	$\text{MnI} \rightarrow \text{Mn} + \text{I}$	279.1 ± 13	66.7 ± 3	283.3	67.7	Flame photometry	1961	34
Mn-Mn	$\text{Mn}_2 \rightarrow 2\text{Mn}$	< 88	< 21			Effusion; M.S.	1964	56
	$\text{Mn}_2(\text{CO})_{10} \rightarrow 2\text{Mn}(\text{CO})_5$			142 ± 54	34 ± 13	($T = 375\text{--}419\text{ K}$); $\Delta H_{\text{sub.}}$; V.P.	1960	183
Mn-O	$\text{MnO} \rightarrow \text{Mn} + \text{O}$	402 ± 13	96 ± 3	406	97	Flame photometry	1959	176
Mn-S	$\text{MnS} \rightarrow \text{Mn} + \text{S}$	298.7 ± 17	71.4 ± 4			Effusion; M.S.	1965	114
Mo-O	$\text{MoO} \rightarrow \text{Mo} + \text{O}$	485 ± 63	116 ± 15			M.S.	1960	199
	$\text{MoO}_2 \rightarrow \text{MoO} + \text{O}$	749	179			Effusion; V.P.; $D_1 + D_2 = 285$	1958	101
		611 ± 105	146 ± 25			M.S.; $D_1 + D_2 = 262 \pm 10$	1960	199
		669 ± 84	160 ± 20					
	$\text{MoO}_3 \rightarrow \text{MoO}_2 + \text{O}$	527	126			Effusion; V.P.; $D_1 + D_2 + D_3 = 410.3$	1958	101
		623 ± 130	149 ± 31			M.S.; $D_1 + D_2 + D_3 = 411.7$	1960	199
		561 ± 84	134 ± 20					
N-Br	$\text{NBr} \rightarrow \text{N} + \text{Br}$	289 ± 59	69 ± 14			Spectroscopic; L.B.S. of ground state	1950	4
		280 ± 21	67 ± 5			Spectroscopic	1961	38
		285 ± 21	68 ± 5					
	$\text{ONBr} \rightarrow \text{NO} + \text{Br}$			117	28	Calculated from equilibrium constants.	1962	6
		116.23	27.78	119.96	28.67	Thermochemical; based on 9	1967	
		116.3 ± 6.3	27.8 ± 1.5	120.1 ± 6.3	28.7 ± 1.5			
N-Cl	$\text{NCl} \rightarrow \text{N} + \text{Cl}$			259	62	Thermochemical	1962	6
	$\text{NCl}_2 \rightarrow \text{NCl} + \text{Cl}$			280	67	Thermochemical	1962	6
	$\text{NCl}_3 \rightarrow \text{NCl}_2 + \text{Cl}$			381	91	Thermochemical	1962	6

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
N-F	ONCl \rightarrow NO + Cl			155	37	Calculated from equilibrium constants	1962	6
		156.1	37.3	160.2	38.3	Thermochemical; based on 9	1967	
		155 \pm 6	37 \pm 1.5	159 \pm 6	38 \pm 1.5			
	O ₂ NCl \rightarrow NO ₂ + Cl			141.4	33.8	Thermochemical	1962	6
		138.1	33.0	142.3	34.0	Thermochemical; based on 9	1967	
		138 \pm 4	33.0 \pm 1	142.3 \pm 4	34.0 \pm 1			
	NF \rightarrow N + F	251 \pm 42	60 \pm 10	255	61	Estimate Thermochemical	1962	6
		297	71				1961	161
		297 \pm 42	71 \pm 10	301 \pm 42	72 \pm 10			
	NF ₂ \rightarrow NF + F	295.0 \pm 6.7	70.5 \pm 1.6			Thermochemical; M.S. Thermochemical Thermochemical	1961	107
		297	71				1961	161
		332.2 \pm 42	79.4 \pm 10	336.8	80.5		1962	6
		314 \pm 21	75 \pm 5	318 \pm 21	76 \pm 5			
	NF ₃ \rightarrow NF ₂ + F	244.3 \pm 18.4	58.4 \pm 4.4			Thermochemical; M.S. Thermochemical Thermochemical A.P.; M.S. Thermochemical Thermochemical; based on 9	1961	107
		238	57				1961	161
		230	55				1961	126
	238	57			1961		126	
	238.1 \pm 21	56.9 \pm 5	243.5	58.2	1962		6	
	241.4	57.7	246.9	59.0	1967			
	238 \pm 8	57 \pm 2	243 \pm 8	58 \pm 2				
ONF \rightarrow NO + F	231.8	55.4			Calorimetric Thermochemical Thermochemical; based on 9	1959	182	
	231.8 \pm 8	55.4 \pm 2	236.8	56.6		1962	6	
	231.0	55.2	235.6	56.3		1967		
	231.0 \pm 4	55.2 \pm 1	235.6 \pm 4	56.3 \pm 1				
O ₂ NF \rightarrow NO ₂ + F			187.0	44.7	Thermochemical; $\Delta H_{f(298)}^\circ \text{NO}_2\text{F} = -20 \pm 5$	1962	98	
	197 \pm 21	47 \pm 5	197 \pm 21	47 \pm 5	Thermochemical; from 9 and $\Delta H_{f(298)}^\circ \text{NO}_2\text{F} = -20 \pm 5$	1967		
	192 \pm 21	46 \pm 5	188 \pm 21	45 \pm 5				
N-H	NH \rightarrow N + H	347 \pm 13	83 \pm 3			A.P.; M.S. A.P.; M.S. Spectroscopic; ³ II - ³ Σ - absorption; shock tube	1958	130
		347 \pm 13	83 \pm 3	351	84		1962	6
		309.6 \pm 15	74.0 \pm 3.7				1966	49
		356	85	360	86	Thermochemical; based on 9	1967	
		356 \pm 8	85 \pm 2	356 \pm 8	85 \pm 2			
	NH ₂ \rightarrow NH + H			385	92	E.I.; M.S. Thermochemical Thermochemical; based on 9	1959	200
		377 \pm 17	90 \pm 4	381	91		1962	6
				377	90		1967	
		372 \pm 8	89 \pm 2	377 \pm 8.4	90 \pm 2			

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.	
		0 K		298 K					
		kJ/mol	kcal/mol	kJ/mol	kcal/mol				
N-N	$\text{NH}_3 \rightarrow \text{NH}_2 + \text{H}$			444 ± 13	106 ± 3	E.I.; M.S.	1958	105	
		435 ± 8	104 ± 2	441.0	105.4	Thermochemical	1962	6	
		431 ± 8	103 ± 2	435	104	Thermochemical; based on 9	1967		
	$\text{N}_2\text{H}_4 \rightarrow \text{N}_2\text{H}_3 + \text{H}$			318 ± 21	76 ± 5	E.I.; M.S.	1958	105	
				318	76	E.I.; M.S.	1959	128	
				318 ± 8	76 ± 2				
	$\text{N}_2 \rightarrow 2\text{N}$	941.69 ± 0.46	225.07 ± 0.11	945.42	225.96	Analysis of spectroscopic and other data	1962	6	
		941.685	225.068	945.408	225.958	Thermochemical;	1967		
		941.69	225.07	945.42 ± 0.04	225.96 ± 0.01	based on 9			
		± 0.04	± 0.01						
		$\text{N}_2\text{F}_4 \rightarrow 2\text{NF}_2$			115.9 ± 29	27.7 ± 7	A.P.; M.S.	1960	110
					90.0 ± 6.7	21.5 ± 1.6	A.P.; M.S.	1961	107
					86.6	20.7	A.P.; M.S.	1961	161
					83.3	19.9	Equilibrium; N_2F_4 = 2NF_2 ; Manometer	1961	126
					90.8	21.7	Equilibrium N_2F_4 = 2NF_2 ; Spectrophotometric	1961	126
					81.2 ± 2.9	19.4 ± 0.7	Shock tube dissociation of N_2F_4	1965	39
		$\text{N}_2\text{H}_4 \rightarrow 2\text{NH}_2$	87.9	21.0	93.3	22.3	Thermochemical;	1967	
			84 ± 4	20 ± 1	88 ± 4	21 ± 1	based on 9		
				243 ± 38	58 ± 9	E.I.; M.S.	1958	105	
				251	60	A.P.; M.S.	1959	128	
				259	62	Pyrolysis of N_2H_4	1962	6	
				238.9	57.1	Pyrolysis; Toluene carrier	1963	156	
	$\text{HN}_3 \rightarrow \text{NH} + \text{N}_2$			247	59	Thermochemical;	1967		
				247 ± 13	59 ± 3	based on 9			
	$\text{N}_2\text{O} \rightarrow \text{NO} + \text{N}$	29	7	39.7	9.5	A.P.; M.S.	1958	130	
				38	9	Thermochemical;	1967		
				38 ± 4	9 ± 1	based on 9			
	$\text{N}_2\text{O}_3 \rightarrow \text{NO} + \text{NO}_2$			$< 434.3 \pm 9.6$	$< 103.8 \pm 2.3$	A.P.; M.S.	1961	59	
		475.7 ± 4	113.7 ± 1	481.6	115.1	Thermochemical	1962	6	
		475.09	113.55	480.91	114.94	Thermochemical;	1967		
		474.9 ± 4	113.5 ± 1	480.7 ± 4	114.9 ± 1	based on 9			
	$\text{N}_2\text{O}_3 \rightarrow \text{NO} + \text{NO}_2$	36.4 ± 4.2	8.7 ± 1	41.0	9.8	Equilibrium data	1962	6	
		35.1	8.42	39.5	9.49	Thermochemical;	1967		
		35.1 ± 0.8	8.4 ± 0.2	39.7 ± 0.8	9.5 ± 0.2	based on 9			

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
	$\text{N}_2\text{O}_4 \rightarrow 2\text{NO}_2$	50.84 53.43 53.18 53.1 ± 2.1	12.15 12.77 12.71 12.7 ± 0.5	54.68 57.28 ± 0.21 57.20 57.3 ± 2.1	13.07 13.69 ± 0.05 13.67 13.7 ± 0.5	Equilibrium $\text{N}_2\text{O}_4 = 2\text{NO}_2$ Recalculated equilibrium data Thermochemical; based on 9	1962 1962 1967	64 6 6
Na-Br	$\text{NaBr} \rightarrow \text{Na} + \text{Br}$	366.1 356.9 366.1 ± 13	87.5 85.3 87.5 ± 3	370.3 370.3 ± 13	88.5 88.5 ± 3	Thermochemical; fluorescence Theoretical	1962 1963	6 188
Na-Cl	$\text{NaCl} \rightarrow \text{Na} + \text{Cl}$	410 ± 2 423.0 410 ± 8	98 ± 0.5 101.1 98 ± 2	410.0 410 ± 8	98.0 98 ± 2	Thermochemical Theoretical	1962 1963	6 188
Na-I	$\text{NaI} \rightarrow \text{Na} + \text{I}$	301.7 ± 8 295.4 ± 0.4 308.4 297 ± 8	72.1 ± 2 70.6 ± 0.1 73.7 71 ± 2	 299.6 301 ± 8	 71.6 72 ± 2	Thermochemical; fluorescence Theoretical	1961 1962 1963	34 6 188
Na-O	$\text{NaOH} \rightarrow \text{Na} + \text{OH}$			381 ± 13	91 ± 3	Thermochemical	1962	6
		322 ± 17	77 ± 4			Flame photometry	1966	192
	$\text{NaO}_2 \rightarrow \text{NaO} + \text{O}$	272 ± 13	65 ± 3			Flame photometry	1966	194
Nd-F	$\text{NdF} \rightarrow \text{Nd} + \text{F}$			545.2 ± 12.6	130.3 ± 3.0	Effusion; M.S.	1966	171
Nd-O	$\text{NdO} \rightarrow \text{Nd} + \text{O}$	692.9 ± 28.9 690 ± 25 690 ± 42	165.6 ± 6.9 165 ± 6 165 ± 10	 695 695 ± 42	 166 166 ± 10	Effusion; M.S. M.S.	1960 1962	96 6
Ni-Br	$\text{NiBr} \rightarrow \text{Ni} + \text{Br}$	356 ± 13	85 ± 3	360	86	Flame photometry	1961	34
Ni-Cl	$\text{NiCl} \rightarrow \text{Ni} + \text{Cl}$	368 ± 21 314 347 ± 42	88 ± 5 75 83 ± 10	372	89	Flame photometry Thermochemical	1961 1962	34 6
Ni-I	$\text{NiI} \rightarrow \text{Ni} + \text{I}$	289 ± 21	69 ± 5	293	70	Flame photometry	1961	34
Ni-Ni	$\text{Ni}_2 \rightarrow 2\text{Ni}$	228.0 ± 2.1	54.5 ± 0.5			Effusion; M.S.	1964	76

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.	
		0 K		298 K					
		kJ/mol	kcal/mol	kJ/mol	kcal/mol				
O-H	OH \rightarrow O + H			431.4 ± 19.2	103.1 ± 4.6	A.P.; M.S.;	1956	111	
						Spectroscopic	1961	40	
		424.09 ± 1.3	101.36 ± 0.3	428.19	102.34	Spectroscopic;	1962	6	
						extrapolation of			
	H ₂ O \rightarrow OH + H	424.09	101.36	428.19	102.34	A ² II and B ² Σ.	1967		
		423.8 ± 2.1	101.3 ± 0.5	428.0 ± 2.1	102.3 ± 0.5	Thermochemical;			
						based on 9.			
				485.3 ± 19.2	116.0 ± 4.6	A.P.; M.S.	1956	111	
		485.8 ± 4.2	116.1 ± 1.0	490.8	117.3	Spectroscopic [OH]	1961	41	
		488.3	116.7			A.P.; M.S.	1958	198	
		492.5	117.7			Recalculation of data	1959	88	
						from Ref. 198.			
		493.7 ± 0.1	118.0 ± 0.03	498.7	119.2	Thermochemical	1962	6	
		493.63	117.98	498.73	119.20	Thermochemical;	1967		
		493.7 ± 0.8	118.0 ± 0.2	498.7 ± 0.8	119.2 ± 0.2	based on 9			
		HO ₂ \rightarrow H + O ₂	197 ± 13	47 ± 3	201.7	48.2	A.P.; M.S.	1956	111
			192	46	197	47	Thermochemical;	1967	
			192 ± 13	46 ± 3	197 ± 13	47 ± 3	based on 9		
H ₂ O ₂ \rightarrow HO ₂ + H	369.0	88.2	374.5	89.5	A.P.; M.S.	1956	111		
	365.3 ± 8	87.3 ± 2	370.7	88.6	Thermochemical	1962	6		
	372	89	377	90	Thermochemical;	1967			
	370.3 ± 8.4	88.5 ± 2.0	374.5 ± 8.4	$89.5 \pm 2.$	based on 9				
O-O	O ₂ \rightarrow 2O	493.59 ± 0.21	117.97 ± 0.05	498.40	119.12	Spectroscopic; extrapo-	1962	6	
						lation of B ³ Σ ⁻ μ.			
		493.570	117.966	498.340	119.106	Thermochemical;	1967		
		493.59 ± 0.4	117.97 ± 0.1			based on 9			
	HO ₂ \rightarrow OH + O	266.1 ± 8	63.6 ± 2	271.5	64.9	Thermochemical	1962	6	
		259	62	268	64	Thermochemical;	1967		
		264.4 ± 4	63.2 ± 1			based on 9			
	H ₂ O ₂ \rightarrow 2OH	203.8	48.7	210.5	50.3	Photochemical		6	
		200.0 ± 13	47.8 ± 3			E.I.; M.S.	1958	198	
		202.5	48.4			Recalculation of	1959	88	
						Ref. 198 data			
				198.74	47.50	Kinetic	1958	42	
		204.2	48.8			Kinetic	1959	87	
				209.2 ± 13.4	50.0 ± 3.2	A.P.; M.S.	1962	119	
		207.36 ± 1.46	49.56 ± 0.35	214.14	51.18	Thermochemical	1962	6	
		207.44	49.58	214.22	51.20	Thermochemical;	1967		
		207.1 ± 2.1	49.5 ± 0.5	213.8 ± 2.1	51.1 ± 0.5	based on 9			
FO ₂ \rightarrow FO + O	463.2	110.7			A.P.; M.S.	1966	152		

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.		
		0 K		298 K						
		kJ/mol	kcal/mol	kJ/mol	kcal/mol					
	$\text{F}_2\text{O}_2 \rightarrow 2\text{FO}$			259.8	62.1	Thermochemical; assumptions of O-F bond energies	1959	131		
		434.3	103.8	260.7 ± 84	62.3 ± 20	Thermochemical A.P.; M.S. on F_2O_2	1962	6		
				326	78	Thermochemical; based on 9	1965	149		
							1967			
Os-O	$\text{OsO}_4 \rightarrow \text{OsO}_3 + \text{O}$	452	108			A.P.; M.S.	1965	147		
				302.9	72.4	Thermochemical; based on 9	1967			
				301 ± 21	72 ± 5					
P-O	$\text{PO} \rightarrow \text{P} + \text{O}$	592.0 ± 2.5	141.5 ± 0.6	595.4	142.3	Spectroscopic; con- vergence of $\text{B}^2\Sigma$ levels	1962	6		
		520.9	124.5			Theoretical	1965	146		
		592.0 ± 4	141.5 ± 1	595.4 ± 4	142.3 ± 1					
P-P	$\text{P}_2 \rightarrow 2\text{P}$	485.60 ± 0.38	116.06 ± 0.09	489.07	116.89	Spectroscopic; pre- dissociation of $\text{B}^1\Sigma$; graphical extrapolation of $\text{X}^1\Sigma$	1962	6		

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Pb-Te	$\text{PbTe} \rightarrow \text{Pb} + \text{Te}$	215.1 ± 8.4	51.4 ± 2.0			Effusion; M.S. M.S.	1961	159
		215.1 ± 8	51.4 ± 2	218.8	52.3		1962	6
		215.1 ± 8	51.4 ± 2	218.8 ± 8	52.3 ± 2			
Rb-Br	$\text{RbBr} \rightarrow \text{Rb} + \text{Br}$	383.7 ± 8	91.7 ± 2			Flame photometry Thermochemical	1961	34
		385 ± 25	92 ± 6				1962	6
		385 ± 25	92 ± 6					
Rb-Cl	$\text{RbCl} \rightarrow \text{Rb} + \text{Cl}$	424.7 ± 8	101.5 ± 2			Flame photometry Thermochemical	1961	34
		459.4 ± 13	109.8 ± 3	463.2	110.7		1962	6
		444 ± 21	106 ± 5	448 ± 21	107 ± 5			
Rb-F	$\text{RbF} \rightarrow \text{Rb} + \text{F}$	502 ± 33	120 ± 8			Flame photometry Thermochemical	1961	34
		477 ± 13	114 ± 3	480.3	114.8		1962	6
		490 ± 21	117 ± 5	494 ± 21	118 ± 5			
Rb-I	$\text{RbI} \rightarrow \text{Rb} + \text{I}$	339.7 ± 8	81.2 ± 2			Flame photometry Thermochemical	1961	34
		323.0 ± 13	77.2 ± 3	326.8	78.1		1962	6
		331 ± 13	79 ± 3	335 ± 13	80 ± 3			
Rb-O	$\text{RbOH} \rightarrow \text{Rb} + \text{OH}$	347 ± 8	83 ± 2			Flame photometry	1966	192
Ru-O	$\text{RuO}_4 \rightarrow \text{RuO}_3 + \text{O}$	435	104			A.P.; M.S.	1965	147
S-F	$\text{SO}_2\text{F} \rightarrow \text{SO}_2 + \text{F}$	67.53	16.14			A.P.; M.S.	1958	117
	$\text{SO}_2\text{F}_2 \rightarrow \text{SO}_2\text{F} + \text{F}$	656.1	156.8			A.P.; M.S.	1958	117
	$\text{SF}_6 \rightarrow \text{SF}_5 + \text{F}$	≤ 326	≤ 78			A.P.; M.S.	1961	160
S-H	$\text{HS} \rightarrow \text{H} + \text{S}$	340.6 ± 12.1	81.4 ± 2.9	344.3	82.3	Spectroscopic; ex- trapolation of $A^2\Sigma$ Thermochemical; based on 9	1962	6
		351	84	356	85		1967	
		349.4 ± 6.3	83.5 ± 1.5	353.1 ± 6.3	84.4 ± 1.5			
	$\text{H}_2\text{S} \rightarrow \text{HS} + \text{H}$	379.5	90.7	384.9	92.0 ± 3	Thermochemical Thermochemical; based on 9	1962	6
		377	90	381	91		1967	
		377 ± 4	90 ± 1	381 ± 4	91 ± 1			

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.	
		0 K		298 K					
		kJ/mol	kcal/mol	kJ/mol	kcal/mol				
S-O	SO \rightarrow S + O	497.1	118.8			A.P.; M.S.	1958	117	
		531.8	127.1			Spectroscopic; B.S. extrapolation	1962	45	
		517.02 \pm 0.13	123.57 \pm 0.03	521.70	124.69	Spectroscopic; pre-dissociation	1962	6	
		516.7	123.5			Spectroscopic	1964	77	
		517.1	123.6			Spectroscopic; examination of data	1965	75	
		517.1	123.6	521.7	124.7	Thermochemical; based on 9	1967		
		517.1 \pm 8	123.6 \pm 2						
	SO ₂ \rightarrow SO + O			385 \pm 29	92 \pm 7	A.P.; M.S.	1957	44	
				548	131	Thermochemical; secondary source	1959	113	
		541.58 \pm 1.3	129.44 \pm 0.3	546.51	130.62	Thermochemical	1962	6	
		515.9 \pm 33.5	123.3 \pm 8			Spectroscopic; continuum limit	1964	77	
		547.3	130.8	552.3	132.0	Thermochemical; based on 9	1967		
			547.3 \pm 8	130.8 \pm 2.0					
	SO ₃ \rightarrow SO ₂ + O	341.83 \pm 0.63	81.70 \pm 0.15	347.3	83.0	Thermochemical	1962	6	
		342.50	81.86	348.07	83.19	Thermochemical; based on 9	1967		
		342.7 \pm 4	81.9 \pm 1	348.1 \pm 4	83.2 \pm 1				
	S-S	S ₂ \rightarrow 2S	414.6	99.1			Secondary source	1959	112
			424.3	101.4			Theoretical	1961	158
412.1 \pm 2.5			98.5 \pm 0.6	417.6	99.8	Thermochemical	1962	6	
424.7			101.5			Dissociation equilibrium; M.S.	1963	81	
407.5 \pm 18.8			97.4 \pm 4.5			Effusion; M.S.; CaS	1964	189	
391.2 \pm 29			93.5 \pm 7			Effusion; M.S.; SrS	1964	189	
395.8 \pm 23.0			94.6 \pm 5.5			Effusion; M.S.; BaS	1964	189	
425.1			101.6	429.3	102.6	Thermochemical; based on 9	1967		
			424.7 \pm 6.3	101.5 \pm 1.5	428.9 \pm 6.3	102.5 \pm 1.5			
H ₂ S ₂ \rightarrow 2HS			261.9	62.6			Theoretical	1961	158
				277.0 \pm 25	66.2 \pm 6	Thermochemical	1962	6	
				247 \pm 13	59 \pm 3	A.P.; M.S.	1962	97	
				274.9	65.7	Thermochemical; based on 9	1967		
			272 \pm 21	65 \pm 5					
Sb-Sb		Sb ₂ \rightarrow 2Sb	295.4 \pm 6.3	70.6 \pm 1.5	299.6	71.6	Effusion; M.S.	1959	82
Sb-Te		SbTe \rightarrow Sb + Te	251.0	60.0			Effusion; M.S.	1960	61

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Sc-Sc	$\text{Sc}_2 \rightarrow 2\text{Sc}$	108.4 ± 21	25.9 ± 5			Effusion; M.S.	1963	93
Sc-F	$\text{ScF} \rightarrow \text{Sc} + \text{F}$			506 ± 71	121 ± 17	Spectroscopic; L.B.S.	1962	46
Si-H	$\text{SiH} \rightarrow \text{Si} + \text{H}$	310 ± 25	74 ± 6	314.2	75.1	Spectroscopic; extrapolation of $^2\Delta$	1957	47
	$\text{SiH}_4 \rightarrow \text{SiH}_3 + \text{H}$	398.3	95.2	335	80	Thermochemical M.S.	1962 1966	6 153
Sn-O	$\text{SnO} \rightarrow \text{Sn} + \text{O}$	561 ± 8 529.3 ± 8.4 544 ± 21	134 ± 2 126.5 ± 2.0 130 ± 5	565 548 ± 21	135 131 ± 5	Equilibrium $\text{SnO}_2 + \text{Sn} = 2\text{SnO}$ A.P.; M.S.	1962 1965	6 181
Sn-S	$\text{SnS} \rightarrow \text{Sn} + \text{S}$	469 ± 13 460 ± 13 464 ± 21	112 ± 3 110 ± 3 111 ± 5	473 469 ± 21	113 112 ± 5	Thermochemical Effusion; M.S.	1962 1962	6 84
Sr-Cl	$\text{SrCl} \rightarrow \text{Sr} + \text{Cl}$	289 ± 59 410 ± 25 335 ± 84	69 ± 14 98 ± 6 80 ± 20	293 339 ± 84	70 81 ± 20	Spectroscopic; L.B.S. of ground state Flame photometry	1962 1965	6 23
	$\text{SrCl}_2 \rightarrow \text{SrCl} + \text{Cl}$	418 ± 25	100 ± 6	611 ± 59	146 ± 14	Thermochemical Flame photometry	1962 1965	6 23
Sr-F	$\text{SrF} \rightarrow \text{Sr} + \text{F}$	335 ± 67 525.5 ± 13 552 ± 29 540 ± 42	80 ± 16 125.6 ± 3 132 ± 7 129 ± 10	339 774 ± 67	81 185 ± 16	Spectroscopic; L.B.S. of ground state Effusion; M.S. $2\text{SrF} = \text{Sr} + \text{SrF}_2$ Flame photometry	1962 1964 1965	6 68 23
	$\text{SrF}_2 \rightarrow \text{SrF} + \text{F}$	578.2 ± 21 556 ± 42 565 ± 42	138.2 ± 5 133 ± 10 135 ± 10			Thermochemical Effusion; M.S. $2\text{SrF} = \text{Sr} + \text{SrF}_2$ Flame photometry	1962 1964 1965; 1966	6 68 23 21

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Sr-O	SrO \rightarrow Sr + O	469 ± 8	112 ± 2	472 ± 4	112.9	Flame photometry analysis of various data	1962	6
		427 ± 42	102 ± 10			Theoretical	1964	144
		385 ± 25	92 ± 6			Effusion; M.S.	1964	189
		396.6	94.8			Flame photometry; CO flame	1965	71
		515 ± 21	123 ± 5			Flame photometry; H ₂ flame	1966	191
		460 ± 84	110 ± 20					
	SrOH \rightarrow Sr + OH	$\leq 377 \pm 42$	$\leq 90 \pm 10$			Flame photometry; C ₂ H ₂ + CO flame	1957	52
		410 ± 63	98 ± 15				1965	22
	Sr(OH) ₂ \rightarrow SrOH + OH	490 ± 113	117 ± 23			Ref. 191 gives $D_1 + D_2 = 215 \pm 12$ and 22 gives $D_2 = 98 \pm 15$ kcal mol ⁻¹		
Sr-S	SrS \rightarrow Sr + S	222 ± 21	53 ± 5	226	54	Spectroscopic; long λ of continuum	1962	6
		335	80			Effusion; M.S.	1963	80
		310.0 ± 18.8	74.1 ± 4.5			Effusion; M.S.	1964	189
		314 ± 42	75 ± 10					
Ta-O	TaO \rightarrow Ta + O	810.4 ± 50	193.7 ± 12			Effusion; M.S.	1957	115
Te-Se	TeSe \rightarrow Te + Se	241.0	57.6			Effusion; M.S.	1960	61
Te-Te	Te ₂ \rightarrow 2Te	218 ± 8	52 ± 2			Effusion; M.S.	1961	159
Th-O	ThO \rightarrow Th + O	820	196	824	197	M.S.	1962	6
		< 820	< 196			Effusion; M.S.	1963	173
	ThO ₂ \rightarrow ThO + O	< 770	< 184			Effusion; M.S.; Ref. 173 gives $D_1 + D_2 < 375.9$ kcal mol ⁻¹	1963	173
Ti-O	TiO \rightarrow Ti + O	653 ± 25	156 ± 6	657	157	M.S.	1962	6
		541.4	129.4			Theoretical	1964	78
Ti-Ti	Ti ₂ \rightarrow 2Ti	< 243	< 58			Effusion; M.S.	1964	56

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
Tl-Br	TlBr \rightarrow Tl + Br	328.0	78.4	331.8	79.3	Thermochemical; spectroscopic data	1960	140
		324.7	77.6			Flame photometry	1961	34
		326 \pm 21	78 \pm 5	331 \pm 21	79 \pm 5			
Tl-Cl	TlCl \rightarrow Tl + Cl			377	90	Thermochemical; spectroscopic data	1960	140
		364 \pm 8	87 \pm 2			Flame photometry	1961	140
Tl-F	TlF \rightarrow Tl + F	460	110			Thermochemical; spectroscopic	1960	140
		460 \pm 42	110 \pm 10			Flame photometry	1961	34
		452 \pm 10.5	108 \pm 2.5			Calorimetry	1965	148
		423 \pm 14.6	101 \pm 3.5			Effusion; M.S.; Tl + MgF	1966	170
		439 \pm 21	105 \pm 5			= TlF + Mg		
Tl-I	TlI \rightarrow Tl + I	272 \pm 13	65 \pm 3	276	66	Thermochemical	1960	140
		285 \pm 13	68 \pm 3			Flame photometry	1961	34
		280 \pm 21	67 \pm 5	285 \pm 21	68 \pm 5			
U-O	UO \rightarrow U + O	749 \pm 29	179 \pm 7			M.S.	1960	199
	UO ₂ \rightarrow UO + O	674 \pm 59	161 \pm 14			M.S.	1960	199
	UO ₃ \rightarrow UO ₂ + O	640 \pm 88	153 \pm 21			M.S.	1960	199
U-S	US \rightarrow U + S	561 \pm 9.6	134 \pm 2.3			Effusion; M.S.	1966	168
V-O	VO \rightarrow V + O	617.6 \pm 19.2	147.6 \pm 4.6			Effusion; M.S.	1957	116
	VO ₂ \rightarrow VO + O	617.6 \pm 19.2	147.6 \pm 4.6			Effusion; M.S.	1957	116
W-O	WO \rightarrow W + O	678 \pm 42	162 \pm 10			M.S.; Effusion	1959	83
		644 \pm 42	154 \pm 10			M.S.; partial	1960	199
		661 \pm 42	158 \pm 10			pressure		

Table of Bond Dissociation Energies—Continued

Bond	Reaction	Dissociation energy, D°				Method, remarks	Date	Ref.
		0 K		298 K				
		kJ/mol	kcal/mol	kJ/mol	kcal/mol			
	$\text{WO}_2 \rightarrow \text{WO} + \text{O}$	661 ± 42 594 ± 71 628 ± 84	158 ± 10 142 ± 17 150 ± 20			M.S.; Effusion M.S.; partial pressure	1959 1960	83 199
	$\text{WO}_3 \rightarrow \text{WO}_2 + \text{O}$	573 ± 42 615 ± 100 594 ± 42	137 ± 10 147 ± 24 142 ± 10			M.S.; Effusion M.S.; partial pressure	1959 1960	83 199
Y-La	$\text{Yla} \rightarrow \text{Y} + \text{La}$	197	47			Effusion; M.S.	1963	93
Y-Y	$\text{Y}_2 \rightarrow 2\text{Y}$	156.1 ± 21	37.3 ± 5			Effusion; M.S.	1963	93
Zn-S	$\text{ZnS} \rightarrow \text{Zn} + \text{S}$	406 ± 29 203.8 201 ± 13 201 ± 13	97 ± 7 48.7 48 ± 3 48 ± 3	410	98	Spectroscopic; continuum limit Effusion; M.S.; $\text{ZnS} \rightarrow \text{Zn} + 1/2 \text{S}_2$ Effusion; M.S.	1962 1963 1965	6 80 184
Zn-Se	$\text{ZnSe} \rightarrow \text{Zn} + \text{Se}$	132.6 ± 12.6	31.7 ± 3.0			Effusion; M.S.	1965	184
Zr-O	$\text{ZrO} \rightarrow \text{Zr} + \text{O}$	753 ± 21	180 ± 5			Effusion; M.S.	1957	121

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